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WATERSHED WORK PLAN  
NEWMAN LAKE WATERSHED  
SPOKANE COUNTY, WASHINGTON



UNITED STATES DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

Prepared under the authority of the Watershed Protection & Flood Prevention Act ( Public law 566, 83rd. Congress, 68 Stat. 666 ) as amended.

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Addendum

September 1974

Watershed Work Plan

NEWMAN LAKE WATERSHED

Spokane County

Washington

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1. Discount Rate Comparison
2. Display of Impacts to National Economic Development,  
Environmental Quality, Regional Development and  
Social well-being Accounts of Selected Plan
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## Introduction

This addendum is based on the Water Resources Councils Principles and Standards for planning.

The Newman Lake Watershed work plan was developed using current (1973) installation costs, adjusted normalized prices for agricultural commodities, and a discount rate of 6-7/8 percent.

Effects resulting from evaluation of the selected work plan alternative are displayed under separate accounts for National Economic Development, Environmental Quality, Regional Development and Social Well-being.

The abbreviated environmental quality plan has been developed by an interdisciplinary team using information assembled during investigations and analysis for the watershed work plan. This plan developed from the recognition of the watershed problems and needs. Desired environmental effects or component needs are translated from the problems and needs and provide a base for examining appropriate water and land resource use and management opportunities. Opportunities that emphasize contributions to the component needs were selected and are shown as plan elements of the alternative. The cost without the sewer system is estimated to be \$1,085,795.

Features of this alternative could be implemented after the selected plan is installed.



Project costs, benefits, and benefit-cost ratio based on a 5-7/8 percent discount rate, current installation costs, and current normalized prices are:

- |   |           |
|---|-----------|
| 1. Average annual project costs are                     | \$ 38,315 |
| 2. Average annual project benefits are                  | 118,275   |
| 3. The project benefit-cost ratio is                    | 3.1 to 1  |
| 4. The benefit-cost ratio without secondary benefits is | 2.8 to 1  |





Selected Plan

NATIONAL ECONOMIC DEVELOPMENT ACCOUNT

NEWMAN LAKE WATERSHED, WASHINGTON

<u>Components</u>		<u>Measures of effects 1/</u>	<u>Components</u>	<u>Measures of effects 1/</u>	
Beneficial effects:			Adverse effects:		
A. The value to users of increased outputs of goods and services	1. Flood Prevention	\$ 54,070	A. The value of resources required for a plan	1. Project construction	\$30,225
	2. Incidental Recreation	6,515		2. Project administration	4,480
	3. Incidental Fish & Wildlife	22,400		3. Project O & M	8,610
	4. Fish & Wildlife	22,400			
	Total beneficial effects	\$105,385		Total adverse effects	\$43,315
			Net beneficial effects	62,070	
1/ Average annual				Date	March 1974

Selected Plan

ENVIRONMENTAL QUALITY ACCOUNT

NEWMAN LAKE WATERSHED, WASHINGTON

Components

Measures of effects

Beneficial and adverse effects:

- | <u>Components</u>                                | <u>Measures of effects</u>   |
|--|--|
| A. Areas of natural beauty                       | 1. Reduction in beach on south side of the lake.   |
|  | 2. Gravel will be stockpiled along the edge of the channel until it is used for roadfill.                                    |
|  | 3. Reduction of debris on beaches, docks, and other recreational areas.  |
|  | 4. Increased urbanization of remaining natural area along the lakeshore.   |
|  | 5. Reduction of the amount of debris on fields.  |
| B. Biological resources and selected ecosystems. | 1. Substantial improvement to the Newman Lake trout fishery by prevention of fish being washed downstream.                   |
|  | 2. Pondweed and lilies in the lake may increase as a result of lake stabilization.   |
|  | 3. The numbers of spiny-ray fish, such as blue-gill and bass may be reduced as other fishery increases.                      |
|  | 4. Reduction of 460 acres of Type I wetlands used by waterfowl during spring migrations.                                     |
|  | 5. Reduction of waterfowl feeding areas on 375 acres.  |
|  | 6. Removal of 23 acres of uneven aged ponderosa pine from channel construction area causing disturbance to wildlife habitat. |
|  | 7. Muskrat habitat disturbance during project construction.  |

Selected Plan

ENVIRONMENTAL QUALITY ACCOUNT (Cont.)

NEWMAN LAKE WATERSHED, WASHINGTON

<u>Components</u>		<u>Measures of effects</u>
Beneficial and adverse effects:		
B. Biological resources and selected ecosystems (cont.)		D. Irreversible or irretrievable commitments.
		1. Two and one-half acres of land permanently committed to structural measures.
C. Quality considerations of water, land and air resources.		2. Construction materials used in structures, including 266 cy reinforced concrete.
		3. Energy used in construction of structural measures.
	8. Rehabilitation of trout habitat; planting of increased numbers of fish two weeks earlier.	
	9. Recreational use of the lake for water sports extended by about two weeks in the fall due to increased water levels.	
C. Quality considerations of water, land and air resources.	1. Reduction in fertilizer in the outlet channel and sink area.	
	2. Increase in refuse in area due to increased recreational use.	
	3. Reduction of septic tank effluent on the ground surface, and decreased possibility of lake contamination by floodwaters.	
	4. Increased noise and dust during construction.	
	5. Reduced erosion of beaches and agricultural lands.	
	6. Reduced sedimentation on agricultural lands.	

Selected Plan

REGIONAL DEVELOPMENT ACCOUNT  
NEWMAN LAKE WATERSHED, WASHINGTON

<u>Components</u>	<u>Measures of effects 1/</u>		<u>Measures of effects 1/</u>	
	<u>State of Washington</u>	<u>Rest of Nation</u>	<u>State of Washington</u>	<u>Rest of Nation</u>
Income			Income	
Beneficial effects:			Adverse effects:	
A. The value of increased output of goods and services to users residing in the region			A. Value of resources required for planned structures.	
1. Flood Prevention	\$ 54,070	-	1. Project installation	\$6,035 \$24,190
2. Incidental Recreation	6,515	-	2. Project administration	180 4,300
3. Incidental Fish & Wildlife	22,400	-	3. Project O & M	8,610
4. Fish & Wildlife	22,400	-		
B. The value of output to users residing in the region from external economies.				
1. Induced by and stemming from effects	9,040	-	Total adverse effects	14,825 28,490
Total beneficial effects	\$114,425	-	Net beneficial effects	\$99,600 \$-28,490
1/ Average annual				March 1974

Selected Plan

REGIONAL DEVELOPMENT ACCOUNT (cont'd)

NEWMAN LAKE WATERSHED, WASHINGTON

<u>Components</u>		<u>Measures of effects</u> State of Washington   Rest of Nation		<u>Components</u>	<u>Measures of effects</u> State of Washington   Rest of Nation	
C. Employment:				C. Employment		
Beneficial effects:				Adverse effects:		
1. Increase in number and types of jobs	1/			1. Decrease in number and types of jobs	1/	
a. Employment for project construction	5 m/y for 2 yrs.	0		a. Employment for clean up from flood events on cropland and beach area	2 m/y	0
b. Employment for OM&R	1/2-m/y	0		b. County road repair	1/2 - m/y	0
c. Employment in Service and trade activities induced by and stemming from project operation	1 m/y					
d. Employment from more intensive land use	1 m/y	0				
Total beneficial effects	2-1/2 m/y permanent			Total adverse effects	2-1/2 m/y permanent	
	5 m/y for 2 yrs.			Net beneficial effects	5 m/y for 2 yrs.	

1/ Labor is semi-skilled

March 1974



Selected Plan

REGIONAL DEVELOPMENT ACCOUNT (Con.)

NEWMAN LAKE WATERSHED, WASHINGTON

<u>Components</u>	<u>Measures of effects</u>	
	<u>State of Washington</u>	<u>Rest of Nation</u>
D. Regional economic base and stability		
Beneficial effects	The project will provide one percent level of protection to the homeowners around the lake and 10 percent level of protection to cropland below the lake. The value of residential property protected by project measures is 6,000,000 dollars.	-
	The project will create 5 semi-skilled jobs during construction period.	-
Adverse effects	-	-

Selected Plan

SOCIAL WELL-BEING ACCOUNT

NEWMAN LAKE WATERSHED, WASHINGTON

Components

Measures of effects

Beneficial and adverse effects:

A. Real income distribution

1. Create 5 man-years for 2 years of semi-skilled employment.
2. Create regional income benefit distribution of \$54,070 flood prevention benefits by income class as follows:

<u>Income class</u> --Dollars--	<u>Percentage of</u> Adjusted gross Income in Class	<u>Percentage</u> Benefits in Class
< than 3,000	1	7
3,000 - 10,000	33	54
> than 10,000	66	39

3. Local cost to be borne by region total \$14,825.

B. Life, health and safety

1. Provide one percent level of protection to property owners around the lake. Reduce chance of agricultural pollution contaminating lake. Reduce pollution of lake from septic tank flooding. Increase safety of automobile traffic on county road.

C. Education, cultural and recreational

1. Provide a stable fishery on the lake with an additional 50,800 man-days of recreational use by fishermen.
2. Provide a stable lake level thus improving other lake sports such as swimming, boating, and water skiing. 630 man-days added recreational use.





NEWMAN LAKE  
ENVIRONMENTAL QUALITY PLAN

Component	Problems	Component Needs	Plan Element	Environmental Effects
A. Areas of Natural Beauty	<p>1. Increasing number of private homes around lake disrupt the natural beauty. At the present time there are in excess of 600 lakeshore ownerships with over 700 homes built. Although a large percentage of first tier homes have been built, an additional 75 to 100 could still be constructed. With additional emphasis on view property, additional 2nd and 3rd tier homes are being built.</p> <p>2. Mud flats and debris around the lakeshore during low lake levels. With the deterioration of existing lake control structure and barrier it is becoming more difficult to maintain a summer water level. Severe leakage occurs around and through the outlet structure. Newman Lake has an average depth of 18 feet which means that a loss of four to five feet leaves mud banks on a large area of the lake.</p> <p>3. Potential clear cutting or extensive logging would disrupt the natural beauty and wildlife habitat. The watershed contains 21,104 acres of woodland, made up of mixed forest types but predominantly coniferous. Economic considerations of high timber costs could lead to destructive logging operations although most stands are uneven-aged.</p> <p>4. Existing manmade outlet channel with unvegetated reaches. The project outlet channel is 19,000 feet long and passes first through farmlands, 14,000 feet and then woodlands, 5,000 feet. Intermittent maintenance and cattle usage have kept vegetation off portions of the spoil banks and channel sides. About 7,000 feet of the channel through the upland area has inadequate vegetative cover.</p> <p>5. Increasing number, size, and use of access roads. Access roads are a means of managing and utilizing a piece of property. Recreation home sites have increased the miles of access roads within the lake area.</p> <p>6. There are in excess of 230 docks surrounding the lake that are damaged by flooding. These docks are damaged and washed onto the beaches disrupting the scenic quality.</p>	<p>1. Community land use zoning and land use regulations.</p> <p>2. Lake outlet structure to control water level and floodwater barrier improvement</p> <p>3. Environmentally landscaped channel and spoil banks</p> <p>4. Regulate home numbers.</p> <p>5. Limit access roads to homesites.</p> <p>6. Provide land treatment measures.</p>	<p>1. Land Use Regulations and Zoning. County wide land use regulations will need to be passed by county commissioners. Such zoning laws would require that all development be approved by a County Planning Committee; included within this could be the limiting of access roads for urban development and recreational areas and minimum acreage for homesites. Quality and quantity of development could be managed to provide esthetic and healthful environment to the people of the county.</p> <p>2. Lake outlet structure to control water level. A lake outlet structure needs to be built that will control lake level during the summer months as well as allowing spring flood flows to pass. The estimated installation cost of structure is \$50,140. The estimated installation cost of floodwater barrier improvement is \$24,990. <u>1/</u></p> <p>3. Environmentally landscaped channel and spoil banks. To fully protect the lakeshore property to the one percent chance of occurrence flood event some channel enlargement is required. The existing outlet channel is a manmade ditch with spoil banks piled along side. To achieve a better balance between channel and land the spoil banks from enlargement will be spread where possible and ditch banks seeded to appropriate species of grasses and shrubs. Where it is inappropriate to spread the spoil it will be shaped and planted to adaptable grasses and trees. Estimated cost of channel \$325,980. <u>1/</u></p> <p>4. Cropland and pastureland treatment measures to be installed are: a conservation cropping system on 200 acres; irrigation water management on 90 acres; pasture and hayland management on 320 acres; approximately 4,000 feet of drainage field ditches; and seven farm ponds for fish, irrigation, and fire suppression. Measures to be installed on forest lands include: proper grazing use on 1,280 acres; woodland improved harvesting on 3,760 acres; woodland improvement on 1,560 acres; wildlife habitat management on 3,200 acres; and about 200,000 feet of woodland access roads. Estimated cost \$151,225. <u>1/</u></p>	<p>1. Upgrade the quality of homes and esthetics of the watershed, and eventually reduce the density of homes.</p> <p>2. Maintains the quality of the woodland.</p> <p>3. Maintains present access roads.</p> <p>4. Protect lakeshore property from damaging floods. <u>2/</u></p> <p>5. Reduce beach available to homes on the south side of the lake <u>2/</u></p> <p>6. Remove 23 acres of uneven-aged ponderosa pine from channel construction. <u>2/</u></p> <p>7. Improve appearance of channel banks.</p> <p>8. Reduce mud flats.</p>

1/ See work plan under selected alternative.

2/ See environmental impact Statement environmental effects.

# NEWMAN LAKE

## ENVIRONMENTAL QUALITY PLAN

Component	Problems	Component Needs	Plan Element	Environmental Effects
B. Quality Considerations, Water, Land, and Air Resources	<p>7. There are 800 acres of crop and pastureland that are covered with debris from flooding.</p> <p>1. Sewage from private homes. All of the 500 plus homes around the lake at the present time are on septic tanks. Additional homes are being built using septic tanks. High water years such as 1969 and 1973-74 cause overflow of some septic tanks along the lakeshore.</p> <p>2. Erosion and sedimentation. Gully and roadside erosion are the principal erosion types found in the forested portion of the watershed. Sheet and rill erosion occur on the cropland but are generally within tolerable limits of five tons per acre on steeper lands and less on the flat areas. Sediment damages occur on about two acres of agricultural land along the lower portion of Thompson Creek. The rate of sediment entering Newman Lake is about .1 acre feet per square mile of drainage area.</p> <p>3. Motor boats and other recreation activity creates noise problems. There are an estimated 8,500 fisherman days use on Newman Lake. About 90 percent of those days would be from boats with motors. Additional recreation days of boating and water skiing add to the boats and motors during summer months. Winter recreation includes snowmobiling on and around the lake.</p> <p>4. Agricultural wastes contribute to lake contamination. The hay and pasturelands on the north end of Newman Lake are used extensively for early spring and late fall pasture for beef cattle. Water facilities are mainly from Thompson Creek and its tributaries. Overland flooding of these lands also contribute to agripollution of the lake.</p> <p>5. Algae and weed concentrations. Summer water levels recede due to the inability of the existing outlet structure to stop the waterflow. When an area has a water depth of less than three feet, water plants such as cattail can grow profusely. A high eutrophic level results from seepage from septic tanks during periods of warm weather.</p>	<p>7. Form Sewage District and install public facilities.</p> <p>8. Control boat activity.</p>	<p>5. Continue to control boat activity on the lake by setting zones for water skiing activity and speed limits within fishing areas.</p> <p>6. Form Sewage District. The Newman Lake homeowners need to form a sewer district. Present population density is causing some deterioration of water quality during summer months. All new buildings are on septic tank systems. To improve the water quality a community sewage system must be installed. Engineering studies will be required to determine cost of a sewage system. No cost estimates are available.</p>	<p>9. Reduce sediment deposited on croplands.</p> <p>10. Reduce erosion from logged and farmland areas.</p> <p>11. Noise and air pollution associated with project construction activities.</p> <p>12. Reduced pollution from sewage system.</p> <p>13. Stabilized water level.</p> <p>14. Reduced weed concentrates in summer.</p> <p>15. Reduced agricultural related pollution.</p>

NEWMAN LAKE  
ENVIRONMENTAL QUALITY PLAN

Component	Problems	Component Needs	Plan Element	Environmental Effects
C. Biological Resource and Selected Ecosystems	<p>1. Fisheries. Fishing success is considered poor. Flooding in the watershed has an important impact on both fisheries and waterfowl habitat. Floodwaters allow many fish to leave the lake. Some are stranded on agricultural lands after the floodwaters recede. The rest end up in the sink area where predators or a lack of water in later months eliminates them.</p> <p>2. Wildlife: Type I wetland is located on the cropland directly south of the lake and covers approximately 460 acres. Type II wetland is usually without standing water during most of the growing season but is waterlogged within at least a few inches of the surface.</p>	<p>9. Provide fish screening device at lake outlet.</p> <p>10. Water control structure for wetland areas below the lake.</p> <p>11. Public acquisition of wetlands.</p>	<p>7. Provide fish screening device at lake outlet. Fishing is the main recreational aspect of the plans. Present fish screens would be inadequate and are located at a point where they would not function with a new outlet structure. A revolving drum type screen would operate during periods of low flow and high flows. Estimated construction cost of fish screen \$53,460. 1/</p> <p>8. Water control structure for wetlands below the lake. There are 460 acres of Type I wetland, located at the lake outlet, installation of a water control structure could turn 400 acres of these wetlands into a type III wetland or an area covered with water greater than six inches deep during most of the growing season. Construction of pits and mounds throughout this area would provide additional water fowl nesting areas. Estimated cost of structure \$38,000. 1/</p> <p>9. Public acquisition of Type I wetlands would be required. By turning 400 acres of Type I wetlands into Type III wetlands a fringe area around the Type III would be turned into Type I wetland. This area would be about 340 acres. Estimated cost land rights \$222,000. Relocation cost of seven farm units \$70,000. Pave three miles county road \$150,000.</p> <p>Cost - Structural and Land Rights \$1,085,795 *</p> <p>* Does not include sewer costs.</p>	<p>16. Reduce eutrophic level of Newman Lake.</p> <p>17. Improve fisheries by preventing overflow, and stabilizing lake levels.</p> <p>18. Increase waterfowl use of watershed.</p> <p>19. Possible reduction of spiny-ray fish with increase in other fishery.</p> <p>20. Reduce Type I wetlands from 400 to 340 acres.</p> <p>21. Add a type III wetland and waterfowl breeding area of 400 acres.</p> <p>22. Reduce area for upland birds by 400 acres.</p>
D. Irreversible and Irretrievable Commitments of Resources.	<p>1/ See work plan under selected alternative.</p>	Part 3-3		<p>23. There are approximately four acres in the present outlet channel. Two more acres will be used in widening and deepening the existing channel. Approximately 50 percent of this two acres is pastureland, and the rest is in nonuse grassland.</p>



## NEWMAN LAKE

1/ See environmental impact statement environmental effects.

Part 3-4

WATERSHED WORK PLAN

NEWMAN LAKE WATERSHED

Spokane County, Washington

Prepared under the authority of the Watershed  
Protection and Flood Prevention Act (Public Law  
566, 83d Congress, 68 Stat. 666), as amended.

Prepared by:

Board of County Commissioners of Spokane County  
for Newman Lake Flood Control Zone District

Spokane County Conservation District

Game Commission, State of Washington

With Assistance by:

U. S. Department of Agriculture, Soil Conservation  
Service

U. S. Department of Agriculture, Forest Service

SEPTEMBER 1974



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WATERSHED WORK PLAN AGREEMENT

between the

Board of County Commissioners of Spokane County  
for Newman Lake Flood Control Zone District

Local Organization

Spokane County Conservation District

Local Organization

Washington State Game Commission

Local Organization

(hereinafter referred to as the Sponsoring Local Organization)

State of Washington

and the

Soil Conservation Service  
United States Department of Agriculture

(hereinafter referred to as the Service)

Whereas, application has heretofore been made to the Secretary of Agriculture by the Sponsoring Local Organization for assistance in preparing a plan for works of improvement for the Newman Lake Watershed, State of Washington, under the authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83rd Congress; 68 Stat. 666), as amended; and

Whereas, the responsibility for administration of the Watershed Protection and Flood Prevention Act, as amended, has been assigned by the Secretary of Agriculture to the Service; and

Whereas, there has been developed through the cooperative efforts of the Sponsoring Local Organization and the Service a mutually satisfactory plan for works of improvement for the Newman Lake Watershed, State of Washington, hereinafter referred to as the watershed work plan, which plan is annexed to and made a part of this agreement;

Now, therefore, in view of the foregoing considerations, the Sponsoring Local Organization and the Secretary of Agriculture, through the Service, hereby agree on the watershed work plan, and further agree that the works of improvement as set forth in said plan can be installed in about five years.

It is mutually agreed that in installing and operating and maintaining the works of improvement substantially in accordance with the terms, conditions, and stipulations provided for in the watershed work plan:

1. The Sponsoring Local Organization will acquire, with other than PL-566 funds, such land rights as will be needed in connection with the works of improvement. (Estimated cost, \$70,720.)
2. The Sponsoring Local Organization will provide relocation assistance advisory services, make the relocation payments to displaced persons, and otherwise comply with the real property acquisition policies contained in the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646, 84 Stat. 1894) effective as of January 2, 1971, and the Regulations issued by the Secretary of Agriculture pursuant thereto. The costs of relocation payments will be shared by the Sponsoring Local Organization and the Service as follows:

	<u>Sponsoring Local Organization</u> (percent)	<u>Service</u> (percent)	<u>Estimated Relocation Payment Costs</u> (dollars)
Relocation Payments	37	63	<u>1/</u> 0

- 1/ Investigation has disclosed that under present conditions the project measures will not result in the displacement of any person, business, or farm operation. However, if relocations become necessary, relocation payments will be cost-shared in accordance with the percentages shown.
3. The Sponsoring Local Organization will acquire or provide assurance that landowners or water users have acquired such water rights pursuant to state law as may be needed in the installation and operation of works of improvement.

4. The percentages of construction costs of structural measures to be paid by the Sponsoring Local Organization and by the Service are as follows:

<u>Works of Improve- ment</u>	<u>Sponsoring Local Organization</u> (percent)	<u>Service</u> (percent)	<u>Estimated Construction Costs</u> (dollars)
Channel Work; Channel Water Level Control Structure; Floodwater Barrier; Sink Area Preparation; Snow Course & Stream Gage	0	100	263,370
Lake Outlet Structure Radial & Vertical Gates	0	100	5,175
Fish Screens & Gate	50	50	16,675
Remainder of Structure	21	79	43,730

The Sponsoring Local Organization, through the Washington Department of Game, will provide a portion of their share of the cost by furnishing and installing the fish screens with gears, motors, power supply hookup, and the gate for the fish screen bypass, on the base prepared by the contracting organization. The quantity and value of such work will be determined by mutual agreement immediately prior to the signing of the appropriate agreement, and will be set forth in the project or engineering agreement.

5. The percentages of the engineering costs to be borne by the Sponsoring Local Organization and by the Service are as follows:

<u>Works of Improve- ment</u>	<u>Sponsoring Local Organization</u> (percent)	<u>Service</u> (percent)	<u>Estimated Engineering Cost</u> (dollars)
Channel Work; Channel Water Level Control Structure; Floodwater Barrier; Sink Area Preparation	0	100	31,570



5. (Continued)

<u>Works of Improve- ment</u>	<u>Sponsoring Local Organization</u> (percent)	<u>Service</u> (percent)	<u>Estimated Engineering Costs</u> (dollars)
Lake Outlet Structure			
Radial & Vertical Gates	0	100	620
Fish Screens & Gate	0	100	2,000
Remainder of Structure	0	100	5,250

6. The Sponsoring Local Organization and the Service will each bear the costs of project administration which it incurs, estimated to be \$2,630 and \$62,430 respectively.
7. The Sponsoring Local Organization will obtain agreements from owners of not less than 50 percent of the land above each reservoir and floodwater retarding structure that they will carry out conservation farm or ranch plans on their land.
8. The Sponsoring Local Organization will provide assistance to landowners and operators to assure the installation of the land treatment measures shown in the watershed work plan.
9. The Sponsoring Local Organization will encourage landowners and operators to operate and maintain the land treatment measures for the protection and improvement of the watershed.
10. The Sponsoring Local Organization will be responsible for the operation and maintenance of the structural works of improvement by actually performing the work or arranging for such work in accordance with agreements to be entered into prior to issuing invitations to bid for construction work.
11. The costs shown in this agreement represent preliminary estimates. In finally determining the costs to be borne by the parties hereto, the actual costs incurred in the installation of works of improvement will be used.
12. This agreement is not a fund-obligating document. Financial and other assistance to be furnished by the Service in carrying out the watershed work plan is contingent on the availability of appropriations for this purpose.

A separate agreement will be entered into between the Service and the Sponsoring Local Organization before either party initiates work involving funds of the other party. Such agreement will set forth in detail the financial and working arrangements and other conditions that are applicable to the specific works of improvement.

13. The watershed work plan may be amended or revised, and this agreement may be modified or terminated only by mutual agreement of the parties hereto except for cause. The Service may terminate financial and other assistance in whole, or in part, at any time whenever it is determined that the Sponsoring Local Organization has failed to comply with the conditions of this agreement. The Service shall promptly notify the Sponsoring Local Organization in writing of the determination and the reasons for the termination, together with the effective date. Payments made to the Sponsoring Local Organization or recoveries by the Service under projects terminated for cause shall be in accord with the legal rights and liabilities of the parties. An amendment to incorporate changes affecting one specific structural measure may be made by mutual agreement between the Service and the sponsor(s) having specific responsibilities for the particular structural measure involved.
14. No member of or delegate to Congress, or resident commissioner, shall be admitted to any share or part of this agreement, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this agreement if made with a corporation for its general benefit.
15. The program conducted will be in compliance with all requirements respecting nondiscrimination as contained in the Civil Rights Act of 1964, as amended, and the regulations of the Secretary of Agriculture (7 C.F.R. 15.1-15.12) which provide that no person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any activity receiving federal financial assistance.
16. The Sponsoring Local Organization will make a decision on whether to request the Service to advertise, award, and administer contracts for structural measures. This decision must be reached and the work plan supplemented before the signing of the project agreement(s).
17. This agreement will not become effective until the Service has issued a notification of approval and authorizes assistance.

Board of County Commissioners of Spokane County  
for Newman Lake Flood Control Zone District  
Local Organization

By E. W. Barrow  
Title Chairman of the Board  
Address W. 1116 Broadway  
Spokane, WA 99201 Zip Code  
Date December 5, 1974

The signing of this agreement was authorized by a resolution of the governing body of the Board of County Commissioners of Spokane County, for Newman Lake Flood Control Zone District, adopted at a meeting held on December 5, 1974

Rosanne Montague  
(Secretary, Local Organization)  
Address W. 1116 Broadway  
Spokane, WA 99201 Zip Code  
Date December 5, 1974

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Spokane County Conservation District  
Local Organization

By Edward J. Kuhn  
Title Chairman  
Address 1414 4th St.  
Cheney, WA 99004 Zip Code  
Date 12-10-74

The signing of this agreement was authorized by a resolution of the governing body of the Spokane County Conservation District, adopted at a meeting held on 12-10-74.

\_\_\_\_\_  
(Secretary, Local Organization)

Address Rt. 3

Cheney, WA 99004  
Zip Code

Date 12-10-74

\_\_\_\_\_  
Washington State Game Commission  
Local Organization

By John B. Bicknell

Title Regional Manager

Address N 8702 Division

Spokane, WA 99201  
Zip Code

Date 1-3-75

The signing of this agreement was authorized by a resolution of the governing body of the Washington State Game Commission, adopted at a meeting held on August 15, 1970.

/s/ Marjorie L. Mohoric  
(Secretary, Local Organization)

Address 600 N. Capitol Way

Olympia, WA 98504  
Zip Code

Date April 17, 1973



Appropriate and careful consideration has been given to the environmental statement prepared for this project and to the environmental aspects thereof.

Soil Conservation Service  
United States Department of Agriculture

Approved by:

*William A. Bridges*  
State Conservationist

*Jan 9, 1975*  
Date



## WATERSHED WORK PLAN

### NEWMAN LAKE WATERSHED Spokane County, Washington

## SUMMARY OF THE PLAN

### The Watershed

The Newman Lake Watershed is in eastern Washington about 16 miles from Spokane in a northeasterly direction, and includes Newman Lake with a surface area of 1,200 acres. The watershed contains 26,464 acres tributary to a sink area. Hydrologic cover conditions are considered to be reasonably good, with only nominal sediment production. The proximity of the lake to the city of Spokane, good access, and many natural amenities of the watershed, cause the area to be intensively and increasingly used for recreational purposes in addition to agriculture and forestry. The lake has a large potential for development as a trout fishery.

The lake occupies a depression in the glacial drift characteristic of the area. In its native condition, the lake possessed no surface outlet. In pioneer times, an outlet channel was excavated into the south shore of the lake and impounded water was used first for logging purposes and later for irrigation. Lake water no longer is used for irrigation but the outlet channel now disposes of excess water into a natural depression, or sink area, located in permeable glacial gravels. Under present conditions, the lake stage fluctuates with watershed runoff.

### Sponsors

The watershed project is co-sponsored by the Spokane County Board of Commissioners for the Newman Lake Flood Control Zone District; the Spokane County Conservation District; and the Game Commission of the State of Washington.

### Watershed Problems and Measures to be Installed

The major problem to be corrected by the proposed project is the extreme fluctuation in lake level resulting from rapid snowmelt and precipitation. High levels cause overflows which damage lands and properties adjacent to the lake and prevents development and efficient management of the fishery resource within the lake.

Works of improvement included in this work plan consist of land treatment measures and structural measures. The land treatment measures to be applied are to maintain or increase the infiltration of precipitation into watershed lands and to reduce the production or movement of sediment. Structural measures consist of capacity improvements in the outlet channel and sink area; a gated lake outlet structure with fish screens; a snow course on the upper watershed; a water level control structure and a stream gage in the outlet channel; and reinforcement of a floodwater barrier along the southern shore of the lake.

The improved channel, sink area, and gated lake outlet structure will prevent damages from flood events having a frequency greater than once in 10 years on agricultural lands and once in 100 years on urban areas. Improvements to a floodwater barrier along the southern margin of the lake will provide added protection to low-lying lands and properties. The inclusion of a snow course on the upper watershed and a stream gage in the outlet channel along with the present lake staff gage will help predict high and low flows and make possible proper management of the lake level. The water level control structure in the outlet channel will prevent damages to the organic soils from over-drainage. The fish screens in the outlet structure will permit improved management of the fishery habitat and result in enhancement of the lake's fishery and recreational values.

It is estimated that two fiscal years will be required to install the structural measures and that five years will be required to accomplish the installation of land treatment planned for the watershed.

#### Costs and Penefits of the Project

The total project cost is estimated to be \$655,395, of which construction is expected to be \$328,950; engineering, \$39,440; project administration \$65,060; land rights and miscellaneous local expenses \$70,720; and installation of land treatment measures, \$151,225.

The share of the total project cost to be paid from Public Law 566 funds is estimated at \$413,300, or 63 percent; and the share of the project cost to be paid by local landowners and agencies of local and state governments is estimated at \$242,095, or 37 percent.

It is expected that the works of improvement will reduce the average annual damages in the watershed by 95 percent. Benefits from the structural measures are estimated to be \$114,425 annually; and the average annual equivalent of structural measures costs, including operation, maintenance and replacement costs, is estimated at \$43,315, providing a ratio of benefits to costs of 2.6 to 1.

#### Project Installation, Operation, and Maintenance

The Spokane County Board of Commissioners, for Newman Lake Flood Control



Zone District, is the responsible local organization, and will make a decision on whether to have the Soil Conservation Service administer contracts for installation of structural measures at a later date. Acting for Newman Lake Flood Control Zone District, Spokane County will be the agency of local government responsible for operating and maintaining all flood prevention structural measures. Washington State Department of Game will be responsible for maintaining the fish screens and for rehabilitating Newman Lake for improved fishing when feasible. The average annual cost of operation, maintenance, and replacement of the structural measures is estimated at \$8,610.

## WATERSHED RESOURCES

### Environmental Setting

Newman Lake Watershed is located in Townships 26 and 27 North, Range 45 East of the Willamette Meridian, about 16 miles northeast of the city of Spokane in Spokane County. Newman Lake is the principal water feature of the watershed. The upper part of the watershed, an area of forested mountains, includes a part of Mount Spokane State Park. The proximity of Newman Lake to the second largest city in the state, and the many natural amenities of the watershed, make the area important for recreational uses in addition to agriculture and forestry.

Newman Lake watershed lies in the Spokane subregion (1703) of the Columbia-North Pacific water resource region. This region includes all of the Columbia River drainage, the coastal streams of Oregon and Washington and the Closed Basin in south central Oregon. Major physiographic features include the Olympic Mountains, the Willamette-Puget Sound Trough, the Cascade Range, and the Columbia Plateau-Blue Mountains-Snake River Plateau. More than 30 percent of the region lies in the area designated physiographically as the Northern Rocky Mountains.

Subregion 1703 occupies the northeastern part of the region. Physiographically, it lies in the Northern Rocky Mountain Province with principal mountain ranges trending generally northward in roughly parallel lines. The subregion is drained by the Spokane river system.

The topographic and physical features of this watershed are generally typical of the glaciated parts of the subregion and region. Newman Lake is similar to most of the lakes in this subregion, all of which were formed during the Glacial Period.

The watershed contains approximately 26,464 acres, of which 3,250 acres are cropland; 21,104 are woodland and forest; and 2,110 are in miscellaneous uses, such as water, roads, and homesites.

### Physiography

The geology of the watershed area is that of the Okanogan Highlands province. Igneous and metamorphic rocks form the foundation. The metamorphic rock consists of pre-Cambrian age gneiss, while the intrusive

igneous rocks consist of Cretaceous age quartz monzonite. The Newman Lake outlet area is mantled by unconsolidated deposits of Recent age lake deposits and glaciofluvial sediments.

There are sand and gravel pits near the sink area in section 23 and 24, T.26N., R.45E. Apparently production from these pits has been sporadic and total production is not known.

In the upper watershed in the NW $\frac{1}{4}$  section 35, T.27N., R.45E. is a silica deposit estimated at 50 million tons. From 1959 to 1962 about 210,000 tons were mined but it is presently inactive.

Newman Lake occupies a watertight depression in an old valley that formerly drained into the Spokane River. This depression is the result of glacial drift having been deposited along the margins of Spokane Valley during the Pleistocene Epoch. These deposits, consisting principally of stratified silts, sands, and gravels, filled the outlet of the old valley, thereby blocking the pre-glacial drainage system.

The glacial drift generally has smooth surface features except for a basin that presently serves as the water-disposal site for the Newman Lake drainage. This basin, or kettle, probably resulted from the melting of a detached block of ice during recession of the glacier. The glacial sediments that underlie this basin consist of over 200 feet of sands and gravels. The depth to the regional water table is approximately 100 feet.

Rough, mountainous terrain, with elevations up to 4,500 feet, characterizes the watershed. Exceptions to this are the lower two miles of the Thompson Creek flood plain, and the outlet channel flood plain. These flood plains are flat and generally represent earlier extensions of Newman Lake. They have developed by the accumulation of mineral or organic soils. The elevation of the lake outlet is 2,120 feet and of the sink area, 2,080 feet.

The climate of the area is influenced by modified maritime conditions, and typically characterized by cool summers and moderate winters. Orographic influences result in a range of precipitation from an average of 17.19 inches at the lower basin level to probably double that at the higher elevations in the watershed. The average annual precipitation of 17.19 inches, as taken from Spokane Airport data, is distributed throughout the year as follows:

January	2.44	July	.38
February	1.86	August	.41
March	1.50	September	.75
April	.91	October	1.57
May	1.21	November	2.24
June	1.49	December	2.43

Much of the winter precipitation at elevations above 3,000 feet is in



the form of snow, accumulations of more than 100 inches being quite common. This snow melts in March, April, and May.

The Newman Lake area soils on the rolling to steep uplands are mainly medium textured and moderately coarse textured. The soils are underlain by granite and gneiss bedrock within two to five feet of the surface. They formed under conifers from weathered bedrock, mixed in the upper part with volcanic ash. About 1,000 acres of organic accumulations and sandy and gravelly soils formed in glacial outwash are present in level areas. Most of the level areas are near Newman Lake and south of it. The principal soil series are Moscow, Spokane, Vassar, Garri-son, and Marble. Series of lesser extent are Dragoon, Springdale, and Semiahmoo.

Soils of the rolling to steep uplands are well suited to woodlands. They are not generally suited to cultivated crops because of slope, erosion hazard, and short growing season. Some of the deeper soils on lower slopes have been cleared and are used for alfalfa, grass, and small grains. Some of the organic soils are used for oats, grass, and clover. A few areas of sandy and gravelly soils are irrigated and small grains, alfalfa, and vegetable crops are grown.

#### Land Use

The pattern of land use is dominated by farm woodlots and forest areas which comprise about 80 percent of the watershed. Approximately two percent of the watershed can be considered to be of urban population density, the land being used for lakeshore homes. About 12 percent of the area is cropland, and about six percent is in miscellaneous uses, such as water and roads. There are about 75 farm ownerships in the watershed and about 600 lakeshore ownerships. The farms average 300 acres in size. Most of these farms are of the farm woodland type. There are about 18 grain, hay, or livestock farms on the lowlands and terrace lands around and downstream from the lake. About 50 percent of the privately-owned land has conservation plans and is being used within its capabilities. This includes woodland harvest practices where appropriate.

The cropland classification includes all arable land used for close-grown grain or for forage production. (Land used for forage production is also used for close-grown grain at least once in 10 years.) Cropland in the watershed amounts to 3,250 acres. Crop residues on grainland are used for cover during the winter months and the grass cover of lands used for hay and pasture is adequate protection for such uses.

Woodland, most of which is farm forest, comprises 21,104 acres. About four-fifths of the area tributary to Newman Lake is forest land and about the same proportion holds for the total watershed. There is a dense forest cover everywhere except on some rocky ridges. Even here, there is a fairly dense brush cover.

The forest cover is composed of mixed forest types, predominantly conifers. Douglas-fir or western larch are the main species, associated

with varying amounts of ponderosa pine, western white pine, lodgepole pine, white fir, western hemlock or western red cedar. Stands are uneven-aged, with many in sawtimber transition. The area was extensively logged during the turn of the century, and sporadic logging has taken place during the last 20 years. The relogged areas usually have a satisfactory understory. The patches of hardwood are composed mainly of cottonwood and western paper birch. These patches of hardwoods and brush provide good wildlife cover and browse.

In the past 17 years, there have been no forest fires over two acres in size within this watershed. Most fires that do occur begin from lightning strikes. Except for the improved property around Newman Lake where the rural fire district provides protection, the forest land is protected by the Northeast Area Management Unit of the State Department of Natural Resources.

Other lands, totaling 2,110 acres, are in water, farmsteads, and roads; held for lakeshore developments; and in state-owned timber and park areas used for wildlife and recreation.

#### Water Resources

Newman Lake, a 1,200 acre lake with an average depth of 18 feet, is the main water resource of the watershed. The lake is  $2\frac{1}{2}$  miles long and averages three-fourths of a mile in width.

In its native condition the lake possessed no surface outlet. In the early 1900's an outlet channel was excavated into the south shore of the lake and used for floating logs to the mill at Moab. Later a lake outlet structure was built and the channel was used for irrigation. For many years irrigation was under the control of the Otis Orchards Irrigation District. In the summer of 1967 this district became a part of the Spokane Valley Irrigation Development and ceased using water from the lake. Today the lake is used to some extent for fishing and extensively for other water-based recreation.

Newman Lake is a public body of water owned by the State of Washington. Operation is controlled by the Otis Orchards Irrigation District, which is in the process of transferring this power to the Newman Lake Flood Control Zone District. Spokane County, under authority of the State Shoreline Act, and other acts, issues permits for all construction on Newman Lake. The State Department of Game and several of the resorts provide boat launching facilities and public access to the lake. The State Department of Game manages the fishery resources of the lake.

Groundwater in the lake area is difficult to obtain and most homeowners use lake water for domestic purposes. Groundwater is available at moderate depths in the lower portion of the watershed.

Newman Lake is a shallow, well-mixed lake with a high dissolved oxygen content. A moderate algal bloom is present. Lake water is cold and fairly clear. Sediment yield entering the lake is estimated at 2.7



acre feet per year. Over-all quality of water in Newman Lake is considered good.

Thompson Creek, with a minimum recorded flow of 0.5 cfs, is the only perennial tributary flowing into Newman Lake. Water quality is good in the upper reaches of the creek. High animal concentrations on the lower areas creates agri-pollution during portions of the year. The average annual sediment load within Thompson Creek is estimated to be 250 Mg/l. <sup>1/</sup> No formal water quality classification has been established for this stream.

Most of the Thompson Creek channel is still in its natural condition. (N) <sup>2/</sup>. However, the lower two miles was straightened sometime before 1950. (M) <sup>2/</sup>.

The present Newman Lake outlet structure, built shortly after the turn of the century, is in a dilapidated condition. It was built on peat soils which have sunk causing cracks in the structure. This condition has allowed water from the lake to flow largely unchecked through, around, and under the structure. This also allows the lake level to fluctuate rather widely over the course of a year.

Outflow from the lake is then through a manmade channel (M) <sup>2/</sup> to a sink area, approximately three miles to the south at the margin of the Spokane River Valley. Here the flow enters the ground through sands and gravels. There is no surface flow to the Spokane River.

Over the past few years this channel has contained some flow year around because of the poor condition of the outlet structure. Water quality is generally good although there is some fertilizer residue from the cropland along the first mile of the channel.

There are two types of wetlands within the watershed, as defined in Wetlands of the United States, Department of the Interior, Fish and Wildlife Service, Circular C-39. Type 1 wetlands are covered with water or are waterlogged, during variable seasonal periods but are usually well drained during much of the growing season. Type 1 wetland is located on the cropland directly south of the lake and covers approximately 460 acres. Type 2 wetland is usually without standing water during most of the growing season but is waterlogged within at least a few inches of the surface. The sink area at the southeast end of the watershed is classified as Type 2 wetlands and covers an area of 34 acres.

#### Fish and Wildlife Resources

Game fish in Newman Lake are brook and rainbow trout, and spiny-ray fishes. Thompson Creek provides important spawning habitat for brook and rainbow trout. About 65,000 legal size trout are planted in Newman Lake each year by the Washington Department of Game. No data is available on the numbers of spiny-ray fishes. The outlet stream below the lake has no fishery value.

<sup>1/</sup> Milligrams per liter.

<sup>2/</sup> (N) -An unmodified, well-defined natural channel or stream.

(M) -Manmade ditch or previously modified channel.

Newman Lake presently supports about 8,500 angler-days annually. Fishing success is considered poor. Public boat launching facilities and several resorts provide excellent fishing access and other opportunities for recreation.

White-tailed deer and black bear are the only big game animals common to the watershed. They number 200, and 15, respectively. Deer hunters make good use of the area. About 2,200 ruffed grouse, 80 ring-necked pheasants, and 50 California quail make up the upland game bird population found in the area. Present hunting pressure on these species is light, and is not considered important. During the spring and summer months, a variety of diving and dabbling ducks use the area for nesting, feeding, and resting. This migrating population, at its peak, includes 3,000 mallards, 2,000 pintail; 200 widgens, 50 geese; and 50 swans. Resident populations are 100 coots and 50 mallards. Mink and muskrat are the principal fur-bearers within the area, and occasionally a few are trapped. There are about 100 muskrat and 20 mink within the watershed. 1/

There are approximately 142 species of birds other than ducks, geese and swans that spend at least some of the year in the Newman Lake area. Seventy-one varieties are present only during the breeding season. Twenty-five varieties utilize the lake and surrounding areas during spring or fall migration periods. Fifteen species are primarily seen during late fall, winter, and early spring. Thirty-one species are permanent year around residents of the Newman Lake area. Data on numbers of birds are not available at this time.

#### Economic Data

Newman Lake Watershed contains approximately 26,464 acres, of which 3,250 acres are croplands, 18,784 acres are farm woodlands, and 2,320 acres are forest lands in state ownership, mostly within Mount Spokane State Park. In addition, there are about 1,200 acres of water, 150 acres in farmsteads, 480 acres in lakeside homesites, and 280 acres used for roads and miscellaneous purposes.

The economy of the area is tied to that of the city of Spokane and is relatively stable. Year-round population of the area is approximately 400 persons, with 125 being in the labor force. The average annual unemployment rate for the first 9 months of 1973 in the area was 7.0 percent. Income level for the area was about \$7,500, with most of this coming from employment in the Spokane area. Other sources of income are farming and recreation services during the summer months.

There are about 400 permanent residents in the Newman Lake Watershed and a summer population of approximately 1,800 persons. The entire area is considered as rural, although the density of housing in the lake area would qualify it as urban by census standards. The shorelands for the most part have been developed into year-round and summer

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1/ All numbers approximate.



homes. Slightly more than one and one-half miles of shorelands remain to be developed, but are expected to be developed during the next 25 years. Lots around the lake run from \$100 to \$200 per front foot. Many of the residents work in the Spokane metropolitan area and live at the lake during the summer months or permanently.

The watershed is served by a paved county road which provides access to lake properties as well as to the farmed areas. School bus routes are maintained and roads are kept open during the winter months. Forest trails and logging roads furnish access to the timbered uplands. More access roads are needed to facilitate better management of the forested area.

There are 75 farms in the watershed 18 of which produce general agricultural products--hay, grain, row crops, and livestock for both beef and dairy products. These farmlands are valued from \$400 to \$600 an acre, or an average per unit of about \$50,000. All or parts of 14 farms are located in the flood plain.

Wood products are produced on the other 57 ownerships classified as farms. These are, in general, part-time operations where the main income of the owner is from a job in industry. These lands are valued from \$200 to more than \$400 an acre, depending on age and quality of the timber.

Forty-five conservation agreements covering 11,967 acres are currently in effect with the Spokane County Conservation District. Conservation plans have been developed for 39 of these cooperators. The program is one of aiding farmers to better utilize the land resource by proper use for sustained production.

Of the 2,320 acres of state-owned land, 1,469 acres are devoted to park use and 851 acres are in commercial timber stands.

At this time there are in operation six privately-owned resorts which cater to the public, two semi-private church camps, and a camp for the blind. The State Department of Game maintains a public access area for water-based recreation. Commercial resorts provide boat rental services, launching facilities, tackle shops, etc., and cater to the needs of large numbers of recreational fishing, swimming, and water skiing enthusiasts who make use of the lake. Present use of Newman Lake for fishing amounts to 8,500 angler-days per season, and other water-based recreation is estimated to be at least equal to the fishery-based recreation. These recreational uses are expected to materially increase as population pressures become greater.

There are no known archaeological, historical, scientific or unique areas that will be affected by the proposed work. A study was conducted and eight prehistoric campsites were found in the watershed. Also, five sawmill sites, of no historic significance, were found in the watershed. 1/

1/ From report by Washington Archaeological Research Center for Newman Lake Watershed, September, 1974.

Construction along the south end of the lake will not destroy any historic or prehistoric sites. Seasonal fluctuation of the lake should not damage any of the historic or prehistoric sites along the present lake margin. 1/

The State Historic Preservation Officer also was contacted and there are no known sites in or eligible for the National Register of Historic Places. 2/ In the event that an area containing one or more sites is found during construction, the Chief of Archaeological Research for the National Park Service Northwest Region will be notified immediately.

## WATER AND RELATED LAND RESOURCE PROBLEMS

### Land Treatment Problems

The timbered areas of the watershed do not create a sediment hazard at the present time. Logging is of a sporadic nature and only small areas are logged at any one time. The understory is dense and provides ample vegetative cover. Natural restocking is generally adequate. On-going programs for fire suppression and access on forest lands are presently considered adequate.

A land treatment problem would be created by either an accelerated road construction program or a large and intense forest fire. Increased road construction could develop from more favorable stumpage prices for logs or from subdivision projects. Increased logging and more people greatly enhance the possibility of forest fires. Either accelerated road construction or a forest fire would greatly increase the amount of sediment leaving forest land.

Lands in pasture production outside of the flood plain area do not constitute a severe sediment hazard at the present time. These lands, however, are of low native fertility and would benefit from improved pasture management in areas where overstocking appears evident. Lack of proper seedbed preparation, improved grass mixtures in conservation rotation, and improved fertilization programs tend to decrease production and reduce the level of protection to the land.

Economic conditions in this watershed are such that land treatment measures could be installed without creating an undue hardship on the landowners. Existing programs are considered sufficient to assist landowners in installing those needed land treatment measures.

### Floodwater Damages

The major watershed problems are frequent flooding of agricultural lands below the lake, sporadic flooding of farmlands above the lake, and resultant floodwater damages to shoreline properties, roads and bridges and the

1/ From report by Washington Archaeological Research Center for Newman Lake Watershed, September, 1974.

2/ "National Register of Historic Places," Department of the Interior, National Park Services, Federal Register, Vol. 38, No. 39 Pt. 11; February 28, 1973.



fishery resource in Newman Lake. The flood damage is due to a combination of excessive rain and or rapid snowmelt, and an inadequate outlet structure and outlet channel from the lake.

Damages begin on the cropland below the lake in a flood of any significance. Outflow from the lake builds up in the channel because of the lack of an adequate grade. About seven years in 10, the water spills over the channel banks and floods 210 acres of cropland. About one year in 10, 765 acres are damaged.

Flooding of agriculture land upstream from the lake starts when the lake reaches a stage of 2126.1 feet. This stage occurs five out of 10 years, and damages 33 acres. A further rise in lake elevation of .50 foot would occur once every 10 years and damage 89 acres.

The watershed contains 14 farms with 1,030 acres of cropland subject to damage in the one percent chance of occurrence flood. This farmland is valued at \$400 to \$600 an acre, and crop production is about 60 percent in oats and 40 percent in hay. Flooding normally occurs between the end of March and the first of June. Damage results from periods of inundation which delay growth, reduce grass quality, and prevent the seeding of crops at the proper time. Average annual damage is estimated at \$8,520.

Floodwater damage to shoreline property other than agricultural land begins at a lake elevation of 2125.6 feet. This stage occurs on the average, nine out of every 10 years and inundates small portions of low lying beaches. A rise in water elevation of one foot to 2126.6 feet can be expected, on the average, once in 10 years. At this stage beaches and docks are affected as well as some lawns, outbuildings and overflow of some septic tanks.

About 50 acres of shoreline property are damaged by a one percent chance of occurrence flood. Most shoreline property damage is confined to the loss of sand from beaches, destruction of docks, and inundation of lawns and outbuildings. About 300 lots, selling from \$100 to \$200 a front foot are subject to one or more of these damages. Floodwaters gradually spread out over the area never getting very deep in any one place. Flooding of this nature does not constitute a significant threat to human life. Average annual damage to shoreline properties is estimated at \$18,210.

The Washington Department of Game has been planting about 65,000 yearling (legal size) rainbow trout in Newman Lake each spring since 1945. Over the last several years the lake has not been stocked until flood damage has passed because of the chance of loss of fish. Fish still in the lake from previous plantings escape the lake during periods of flooding. Due to present inadequate fish screening and lake level fluctuations, the Game Department has not developed the full potential of this lake. Flooding conditions make installation of fish screens impractical in the absence of measures to reduce flooding. Damage to the fishery from flooding has been calculated at \$4,755 annually.

Maintenance and replacement of county roads and bridges is accelerated due to the flooding that occurs in the watershed. This damage is estimated to be \$2,700 annually.

Indirect damages due to flooding include the increased cost of vector control due to mosquito breeding and nuisance, detouring around washed out roads for east side lake residents, and delays in property owners moving out to the lake and making use of its esthetic properties. Other indirect damages due to flooding include the added cost of testing for possible contamination of domestic water supplies by septic tank effluent, and inoperative condition of septic tanks. These indirect damages total \$3,500 annually.

A typical flood occurred in Newman Lake Watershed in the spring of 1969. Rapid melting of winter snows, accompanied by moderate amounts of rain, damaged 854 acres of cropland from March 23 until May 12. Monetary damages from this flood were calculated to be: agricultural \$21,486; lakeshore properties \$23,000, and an undetermined amount of damage to the fishery resource. A flood of this magnitude is estimated to have a chance of recurring about once in 10 years.

#### Erosion Damage

An annual gross erosion rate of 5.0 tons per acre occurs on the steeper cropland slopes. This erosion diminishes to a negligible rate on the nearly flat cropland located adjacent to Newman Lake. Sheet and rill erosion are the principle types of erosion found on the cropland.

Gully and roadside erosion are the principle erosion types found in the forested portion of the watershed. Forest lands contribute a gross annual erosion rate of 1.0 ton per acre.

The gross erosion rate for the watershed is estimated at 1.2 tons per acre per year.

Small patches of critical sediment source areas may occur immediately following localized timber harvesting. These areas are of short duration and disappear as soon as natural vegetation is reestablished.

Physical erosion damages are restricted to minor roadside erosion. It occurs locally on the steeper road grades within the forested portion of the watershed. Average annual erosion damage is estimated at \$200 annually. Erosion in this watershed is so slight that there is negligible effect on agricultural production and the economy of the watershed.

#### Sediment Damage

Approximately 2 acres of agricultural land is damaged by overbank sediment deposition. This occurs on the extreme lower flood plain of Thompson



Creek prior to its entering Newman Lake. The sediments consist of silts, sands, and gravels which reduce the annual productivity of the pasture land by about 25 percent. Sediment deposition is filling the lower reaches of the Thompson Creek channel. This action reduces the carrying capacity of the channel and subsequently results in overbank deposition.

There are no swamping damages occurring in this watershed.

The average annual sediment yield entering Newman Lake is estimated at 0.1 acre foot per square mile per year. The sediment concentration of stream flows which enter the lake average about 250 Mg/l. These sediments have no measurable effect on water quality and only a minimum effect on lake and stream pollution. Average annual damages are estimated at \$600.

### Recreation

Water quality of Newman Lake is considered good at the present time. The State Department of Game and several of the resorts provide boat launching facilities and public access to the lake. The State Department of Game manages the fishery resources of the lake.

Present year around population of the watershed is estimated at 400 people. It is estimated that an additional 1,400 people reside in the watershed during the summer months. The Spokane area is only 16 miles from the lake and this area is expected to grow from 287,500 people in 1970 to approximately 388,600 people by the year 2000. This increase in population could affect water quality of the lake in future years.

The need for additional water-related recreational facilities in the watershed is considered slight because of the large number of high quality lakes located within easy driving distance of the Spokane area.

### Fish and Wildlife

Land use changes within the watershed have occurred slowly in the past and will probably continue to do so in the future. If land use changes continue as predicted they will have very little effect on wildlife habitat.

Flooding in the watershed has an important impact on both fisheries and waterfowl habitat. Floodwaters allow many fish to leave the lake. Some are stranded on agricultural lands after the floodwaters recede. The rest end up in the sink area where predators or a lack of water in later months eliminates them. In either case they are of no value once they escape the lake. The same floodwaters that reduce the fish population create an average of 460 acres of Type 1 wetlands on the agricultural land around the lake. These wetlands are used by waterfowl

during their spring migration, with peak populations of about 5,000 ducks, 50 geese and 50 swans.

Sedimentation and erosion, as they effect fish and wildlife, are not a problem. Most of the erosion occurs on logged over lands during spring runoff. The sediment that results is deposited long before it reaches Newman Lake. The small amount of sediment entering Thompson Creek does not effect the fishery found there.

There is little opportunity for development of additional wildlife habitat in this watershed. Habitat of the type found in this watershed is prevalent throughout the Spokane Basin. However, there is a need to preserve and better manage the habitat already in existence.

There are no known rare or endangered species found within Newman Lake Watershed.

#### Economic and Social

Approximately 70 percent of the 75 farm ownerships are worked part time with the owner holding a second job in the Spokane metropolitan area. The remaining 30 percent are full time units and none of these could be classified as low income producing units. All farms in the watershed are family farms as none use more than 1½ man-years of hired labor.

The economy of this watershed is directly tied to that of the Spokane area. Over 95 percent of the Newman Lake work force commutes the 15 miles each way to work in the Spokane vicinity. This area is now in the midst of a boom, and job opportunities are better than they have been for several years.

Rural community development stressing increased employment opportunities is unnecessary. However, the need for community action for a sewage system and a water system for around the lake is high at the present time.





*Photo 1. High water is nearly to the floor of this west side Newman Lake dwelling in the spring of 1969.*

SCS PHOTO 9-4192-16

*Photo 2. Floodwaters cover a county road and have completely inundated several fields near the Newman Lake outlet.* SCS PHOTO 9-4181-4



*Photo 3. The present outlet structure has been severely damaged and is being bypassed by the floodwaters. Note flooded fields in the background.*

SCS PHOTO 9-4181-7

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Photo 4. Wreckage of several docks has been deposited at the north end of the lake during the spring 1969 flood. SCS PHOTO 9-4192-10



Photo 5. These docks, torn loose during the height of the flooding, have drifted up onto the shore.

SCS PHOTO 9-4191-11

Photo 6. A view of Newman Lake. Some docks have broken loose from their moorings due to a combination of ice and high water.

SCS PHOTO 9-4181-11







## PROJECTS OF OTHER AGENCIES

There are no authorized works of improvement for water resource development by other agencies which will be affected by or affect the proposed works of improvement included in this plan.

## PROJECT FORMULATION

The application for assistance on this project was approved in October 1967. The first meeting of potential sponsors and all interested agencies and persons was held in February 1968. Planning authority for the project was granted April 1969. Since that time numerous meetings among sponsors, federal, state and local agencies, and other interested persons have been held to provide inputs and discuss objectives and alternatives. Specifically, meetings have been held July 1969, February 1970, April 1970, June 1970, September 1970, and August 1972. Widely advertised public information meetings were held in the Tri-Community grange hall in Moab in September 1970 and March 1973. The informal field review for this plan was held in October and November of 1972 and numerous inputs from this review and the March 1973 public information meeting have been incorporated into the plan.

Reports from the U. S. Forest Service, the State Department of Natural Resources, and the Bureau of Sports Fisheries and Wildlife have been included in this work plan.

The Washington State Game Commission, through the State Department of Game, is a sponsor of the project and has participated in the formulation of the work plan.

The Columbia-North Pacific Comprehensive Framework Study lists the Newman Lake Watershed as needing cooperative watershed development by 1980. Specific areas of development listed were flood protection and land treatment which are areas of important consideration within this project. No resource conservation and development plans have been initiated in this area.

## Objectives

The objectives of the project, as agreed upon by the Sponsoring Local Organization and the United States Department of Agriculture, represented by the Soil Conservation Service and the Forest Service, are as follows:

1. Provide a level of land treatment that will allow proper pasture management to be initiated while keeping erosion within an allowable loss of three tons of soil per acre per year.

2. Provide flood damage protection from the 10 percent (102 cubic foot per second peak discharge) chance storm for cropland and from the one percent (175 cfs peak discharge) chance storm for urban areas around the lake.
3. Provide facilities to allow improved management of the trout fishery resource within the lake.

#### ENVIRONMENTAL CONSIDERATIONS

The effects of this project on the environment have been one of the prime concerns of project formulation. All aspects of the project have been reviewed and those areas where environmental impacts are expected have been individually studied.

The first study looked at additional recreation use of Newman Lake that might evolve because of project measures. Specifically, the study considered what effect increased recreational use might have on health and water quality in the area. It has been determined that any increase in recreational use will occur gradually and state regulations are such that health and water quality will be protected as this increase takes place.

Another study looked at possible downstream damages that might be induced if flood waters were moved out of the flood plain at a faster rate. Specifically, what effect would an increased concentration of water downstream have as to possible channel erosion and contamination of the ground water supply for the Spokane Valley? Study results show that reasonable concentrations of water can be taken downstream without causing any erosion or contamination of ground water supplies.

Different levels of flood protection were studied as to their affects on fish and wildlife, farm production, and the general welfare and well-being of watershed residents. Certain levels of protection maximized stated objectives and minimized adverse impacts to wildlife better than others. Thus a basis for selecting project measures was established.

The probability of a change in fish and wildlife habitat depends upon the land treatment and structural measures selected. There are 460 acres of Type 1 wetland and 34 acres of Type 2 wetland in the watershed. All or a portion of this wetland could be changed from its present classification. Newman Lake presently supports an unmanaged trout and spiny-ray fishery. It has the potential of supporting a managed trout fishery under the right conditions. There are 21,104 acres of high quality forest habitat available for certain species of wildlife at the present time. Measures to benefit some or all of this wildlife land could be provided.

The number of possible displacements of people or enterprises that could occur as the result of project measures was examined closely. Results of this study show relocations would range from a low of zero to a high of 7 farms and 7 families depending on the type of project adopted.



## Alternatives

The first alternative studied was to pump flood waters from the flooded area into the existing channel. This alternative would require a 175 cubic foot per second pumping plant and 8,000 feet of channel work, a new lake outlet structure, an improved flood water barrier around the south side of the lake, some work on the sink area where flood waters will be discharged, and a snow course.

Land treatment measures such as woodland improvement, woodland improved harvesting, woodland access roads, conservation cropping systems, pasture and hayland management, and proper grazing use are all an integral part of this alternative.

The alternative would provide flood protection from the once in 10-years storm for cropland and from the once in 100-year storm for urban areas around the lake. The lake outlet structure and fish screens would allow improved management of the trout fishery resource within the lake. Sediment would be held within acceptable levels and a program of proper pasture management would be initiated. Thus, this alternative would satisfy all of the objectives agreed upon for the Newman Lake project.

Total cost of the alternative would be \$753,000. Of the total, structural measures cost would be \$602,000 and land treatment cost \$151,000. Operation, maintenance and replacement costs would be approximately \$8,600 annually.

Crops and property would be protected improving economic well-being as well as reducing worry and anxiety about losing personal possessions. The trout fishery in the lake would be increased while the spiny-ray fishery would decrease. The recreation season on the lake would be increased by about four weeks. Adverse effects of high water on filter fields would be reduced. About 460 acres of Type 1 and 34 acres of Type 2 wetlands would be lost as wildlife habitat.

Another possible alternative would be to acquire the cropland subject to flooding with funds from other than Public Law 566 origin. This would eliminate many of the existing damages by permitting the lake to expand, thus creating more floodwater storage. This alternative would require a lake outlet structure and some channel work to provide the lakeshore properties with protection from the 100-year chance of occurrence storm. Seven farm units and three miles of paved county road would have to be relocated.

Land treatment measures on the woodlands, such as woodland improvement, woodland improved harvesting, and access roads would be needed.

This alternative would provide flood protection from the once in 100-year storm for urban areas around the lake. The greater lake area would improve the spiny-ray fishery. However, the shallowness of the lake would be detrimental to the trout fishery. Sediment from the woodlands would

be held within acceptable levels. Property around the lake would be protected reducing worry and anxiety about losing personal possessions. The 460 acres of Type 1 wetlands presently found in the watershed would be preserved. Seven farm families would be forced to move and very little agriculture would be left in the watershed. This alternative would satisfy parts of the three objectives agreed upon for the Newman Lake project.

Total installation cost would be \$828,615, of which \$726,910 would be structural measures cost and \$101,705 would be land treatment costs. Operation, maintenance and replacement costs would be approximately \$5,925.

The third alternative studied would leave the area in its present state. This alternative would not satisfy any part of the objectives agreed on for the Newman Lake project.

Flooding, with its hardships on the residents of the area, would gradually grow worse as present facilities continued to deteriorate. Continued deterioration of the outlet structure would reduce fishing and other water based sports. Management of the trout fishery would not be possible under these conditions. Type 1 wetlands would gradually decrease as the lake expanded.

The works of improvement selected for the Newman Lake project were decided upon for several reasons. First of all, they satisfy in full all of the objectives agreed upon for the Newman Lake project. Of the three alternatives studied only the first one would satisfy all of the objectives. Alternative two would satisfy parts of the three objectives and alternative three would satisfy none of the objectives.

Another factor was the cost of installing the project measures. The works of improvement selected would cost considerably less than either alternative one or two.

Only the "do nothing" alternative would cost less in the short run. Over time, the loss of income and deterioration of facilities and property would make this the most expensive alternative studied.

The third factor considered in choosing the project measures was the effect on the quality of the human environment. The "do nothing" alternative would allow the deterioration of property and belongings at an ever accelerating pace. Alternative two would work a hardship on seven families who are making their living farming. Only alternative one would improve the human environment as much as the project measures selected.



## WORKS OF IMPROVEMENT TO BE INSTALLED

### Land Treatment Measures

Land treatment measures necessary to reduce soil loss and sediment damage, and improve agricultural land use are included in this plan. These measures, which contribute to project objectives, will be installed with advice and assistance from the Spokane County Conservation District.

Measures are planned for 620 acres of cropland and pasture land and 12,000 acres of forest land during the five year installation period. These measures will be installed alone, or in combination on non-federal land under programs all ready in progress.

Cropland and pasture land measures to be installed are: a conservation cropping system on 200 acres; irrigation water management on 90 acres; pasture and hayland management on 320 acres; approximately 4,000 feet of drainage field ditches; and 7 farm ponds for fish, irrigation, and fire suppression.

Measures to be installed on forest lands include: proper grazing use on 1,280 acres; woodland improved harvesting on 3,760 acres; woodland improvement on 1,560 acres; wildlife habitat management on 3,200 acres; and about 200,000 feet of woodland access roads.

Because roads are the biggest source of sediment, their maintenance is an important consideration. During the next five years, in addition to furnishing fire protection, the State Department of Natural Resources plans to improve 17 miles of existing road and construct four miles of new road. Owners who cut their timber will be encouraged to take proper conservation measures to protect the timberland and water resources. These measures will be undertaken through the existing state and federal cooperative forestry program.

### Structural Measures

Structural measures consist of an improved channel for the conveyance of excess water, a water level control structure in the channel to prevent overdrainage and subsidence of organic soils, a lake outlet structure with fish screens to manage and regulate outflow from the lake, improvement of an existing floodwater barrier to prevent the lake from overflowing onto cropland south of the lake, improvement of the water disposal sink area, and a snow course and stream gage for improving lake level management. The project map and preliminary plans show the proposed construction. All local, state and federal laws will be followed during project construction.

Channel banks and disturbed areas within the permanent rights-of-way will be allowed to revegetate to natural forbs and woody species where very sandy and gravelly soil conditions are unsuitable for grasses. Although no stability problems are anticipated, areas suitable for survival of grasses and legumes will be seeded, using appropriate methods.



## Channel Work

The remodeled outlet channel will be approximately on the same alignment as the old channel. The channel will be 19,000 feet in length and will extend from the outlet structure at station 97+50 downstream to the water disposal area.

There are four different types of materials through which the channel will be constructed. Materials between stations 97+50 and 98+00 are rock. From stations 98+00 to about 160+00 construction will be in organic or peat materials. The reach between stations 160+00 and 275+00 consists of poorly graded and silty sands. Between stations 275+00 and 286+50 construction will be through basalt rock. The reach between stations 286+50 and 290+00 consists of gravels.

Planned works of improvement for the channel consist of enlarging reaches of the present channel, clearing and snagging, and construction of new channel. Between stations 97+50 and 120+00 a new channel will be dug to allow the placing of the lake outlet structure on a rock foundation. Between stations 120+00 and 276+00 the existing channel will be enlarged. Clearing and snagging of channel debris is the only work scheduled between stations 276+00 and 283+40. New channel will be constructed between stations 283+40 and 286+20. No work is planned between stations 286+20 and 290+00.

The slope of the channel between stations 97+50 and 276+00 will be .0005 feet per foot. The slope of the channel from station 276+00 to station 290+00 will be .018 feet per foot.

The design capacity selected for this channel was based on a regional hydrologic study of the area. This study indicated that 175 cubic foot per second capacity would provide the level of protection on cropland and urban areas that was called for under project formulation. Various slopes and channel sizes were compared to determine which would handle 175 cfs with the fewest environmental effects at the lowest possible cost. It was determined that a channel with a 12 foot bottom and 1.5 to 1 side slopes would best meet these requirements.

Approximately 61 acres of permanent land rights and 31 acres of temporary land rights are required for the channel improvement. Twenty acres are in woodland, 15 acres in cropland and the remaining 57 acres are in existing channels and spoil banks. About 2 acres will be removed as the channel is widened and sloped. Those areas of the channel that are presently fenced will be refenced to prevent animals from falling into the channel. Two county bridges, one farm bridge, and a county culvert must be replaced in order to remodel the outlet channel.

Utility modifications include two pumphouses, an underground cable and five power poles. There will be no displacement of people or farm operations.

### Channel Water Level Control Structure

A water level control structure will be installed in the improved channel to prevent subsidence of organic soils. This structure, located in section 13 near station 185+80, will be gated to regulate the flood flow. The gate may be closed during normal and low-flow periods to prevent overdrainage of the organic soils. This structure will contain a radial gate about 10 feet wide for regulation of larger flows; a vertical rising adjustable weir gate for management of small flows; and an emergency weir to pass any expected flow in the event other gates are not operated.

### Lake Outlet Structure With Fish Screens

This structure will allow controlled discharges and will decrease fluctuations of the lake level caused by variations in climatic conditions and by runoff.

The outlet structure will consist of a reinforced overflow section set on natural rock foundations. The concrete overflow section consists of a weir having a crest elevation of 2126.0 feet USGS datum, and a total length of about 75 feet. A concrete apron will be constructed below the weir to prevent channel erosion. A radial flood gate approximately 10 feet wide will be installed adjacent to the weir to provide controlled outlet discharge of large flows. A vertically rising weir gate will provide low flow management and regulation of the lake below elevation 2126.0 feet mean sea level.

During spring runoff periods, excess water will be discharged through the flood gate. As excess flow diminishes, the flood gate will be closed to allow restoration of the natural level of the lake. Flow issuing through the flood gate will pass into the improved channel and be removed from the area. The capacity of the structure is adequate to give protection to shoreland property and farmland of the area.

Two fish screens of the rotating drum type, approximately eight feet in diameter by 12 feet long, will be installed to prevent fish from escaping downstream. They will be rotated by external power to provide cleaning action and will be protected from large floating debris by trash racks installed upstream from the screens. A bypass gate will be installed parallel to the screens to permit flow to bypass the screens if they should freeze solid. This feature will prevent the lake level from rising because of the blocked screens.

The lake outlet structure will be fenced, and the gate controls will be provided with locks to prevent trespass and unauthorized operation, and as an aid to public safety.



### Floodwater Barrier

The existing floodwater barrier on the southern shore of the lake will be improved by increasing the cross section of the barrier and raising the top elevation moderately (see preliminary plans). Material for this operation is to be excavated from a borrow ditch located along the south side of the barrier. Sod cover presently on the barrier is to be disturbed as little as possible during construction. The constructed barrier will revegetate from rhizomes and other growth spreading from the existing sod. Reed canarygrass is abundant in the peat and muck area. The borrow ditch is to be left in a condition (after excavation) to serve as a drain for the purpose of collecting and conveying any seepage flow to the outlet channel.

Approximately 16 acres of permanent land rights are needed to do the required work on the floodwater barrier. About 8 acres make up the existing floodwater barrier and the other 8 acres are in pasture and lakeside property.

### Sink Area Improvement

Removal of sediment from a portion of the sink area is planned. Silts will be removed to expose the permeable sands and gravels on approximately five acres of the 34 acre sink. Spoil will be piled on designated areas near the sink and on the existing dike, to reinforce the holding capacity for years of exceptional high water.

The dike along the margin of the sink will be reinforced and raised with this spoil material. It is anticipated that the material used in this location will contain grasses, weeds, and other plant materials that normally are not acceptable for dike construction. The old dike in this situation will provide necessary imperviousness and is not dependent on the new fill for hydraulic functions.

Nearly 43 acres of temporary land rights are required for sink improvement. This land is presently used for woodland pasture.

### Snow Course and Stream Gage

A snow course will be installed on Horse Mountain in the upper watershed during the construction period. It will be manually operated and used exclusively for forecasting flows into the lake so that more precise lake level management can be achieved in future years. Details such as type of snow course, measurement schedule and its final location will be worked out during the construction period.

A recording stream gage will be installed below the new outlet structure. This gage and the present lake gage will measure the amount of water coming off the watershed. These two gages will be used to correlate volume of runoff to accumulated snow depth as obtained from snow course measurements.

## EXPLANATION OF INSTALLATION COSTS

### Land Treatment Costs

Estimated costs of installing land treatment measures are summarized in table 1. The figures shown represent the costs of actually applying the land treatment practices on the land. The costs as estimated are for expenditures that will be made by district cooperators and others in performing the work and in purchasing needed materials, based on Agricultural Stabilization and Conservation Program records and local experience of the Soil Conservation Service, Forest Service, and Washington State Department of Natural Resources.

Technical assistance to apply these measures will be furnished by the Soil Conservation Service and others cooperating with the Spokane County Conservation District. These costs include salaries and associated costs incurred by technicians who will assist owners and operators in applying the measures, and are estimated to be \$1,552 annually, or a total of \$7,760 during the installation period, for carrying out the going program of the Soil Conservation Service. In addition, the Washington State Department of Natural Resources is expected to expend \$900 a year, or a total of \$4,500, for cooperative forestry assistance in forested areas.

This going rate of installation is deemed sufficient to meet the needs of the watershed, and no funds will be required to accelerate the installation of land treatment measures.

District cooperators and other nonfederal interests will expend an estimated \$138,965 during the project installation period for applying land treatment measures. The total cost of applying land treatment practices during the five-year period, including technical assistance, is estimated to be \$151,225. The estimated yearly cost of installing land treatment measures is tabulated under "Cost Sharing."

### Structural Measures Costs

The estimated costs of installing structural measures, including construction, engineering services, project administration, and land rights, are shown in tables 1 and 2.

#### Construction Cost

The construction cost is based on engineering estimates of quantities required to provide project structures in accordance with current Soil Conservation Service engineering standards. These quantities, multiplied



by the unit construction costs applicable for this area and increased by a contingency factor of 15 percent, become the total estimated construction cost of \$328,950. The sponsoring local organization will perform work in lieu of cash as a part or all of their share of this cost.

The amount estimated for project construction includes the cost of placing, smoothing, or hauling excavated materials not needed for construction to a place within the permanent right-of-way, or contiguous right-of-way obtained by temporary land rights. The purpose is to conform to local custom for similar work and permit maintenance and reasonable agricultural use, subject to the following limitations:

1. The location for wasting excavated materials must be accepted as to practicality by the Service. Such wasted materials will be piled in shaped trapezoidal embankments parallel to the channel within the right-of-way, or spread in a thin layer on the surface of the ground within the right-of-way where the adjacent land is in agricultural use.
2. Spreading and smoothing in lieu of other methods of spoil disposal shall be to the extent required to permit efficient hydraulic functioning of the channel and to facilitate reasonable agricultural use of adjacent lands, but such operations shall not extend beyond 300 feet in any direction from the point of excavation unless spreading beyond 300 feet is determined by the Service to be less costly to the government than other alternative practical options of disposal. Spreading poorly graded sands, gravels, or other nonagricultural soils materials shall not be considered practical unless requested by the local organization.
3. When it is not practical to spread or otherwise dispose of excavated material by hauling or spreading as described above, it shall be piled or shaped into spoil banks located on rights-of-way adjacent to the excavation but separated by a berm distance designated by the Service. Waste banks shall be provided with pipes or channels, or be interrupted to provide surface water disposal and prevent erosion. Spoil banks shall be shaped to facilitate weed control and other maintenance. After placement, the responsibility for maintenance and/or the further disposal of the materials in the spoil banks is a nonproject cost.

4. The degree of smoothing accomplished with project construction funds will be that reasonably attainable by heavy construction equipment and with consideration of the type and condition of the material being spread.

#### Engineering Services

Engineering services include direct costs of surveys, investigations, design, and preparation of plans and specifications for structural measures. Engineering costs are estimated at \$39,440.

#### Project Administration

This category includes costs associated with the installation of structural measures, such as contract administration and necessary inspection services during construction. Those costs to be borne by Public Law 566 funds are expected to be about \$62,430. Those to be borne by other funds are estimated at \$2,630.

#### Other Costs - Land Rights

This item includes all elements of construction, administration, engineering, and legal services associated with acquiring such rights, including removal or salvage of buildings and improvements, or changes in telephone, power, gas, water, and sewer lines or other utilities. Acquiring of associated construction permits, licenses, and insurance is a land rights cost. Land required is that needed for the construction and occupancy of project structural measures, for the operation and maintenance of such measures, and for flowage easements along the channel or elsewhere that may be needed under conditions of operation that may induce changes in duration or elevation of the lake or channel flows. The general location of these lands is shown in the preliminary plans. Land rights include costs of channel crossings, bridges, or other auxiliary improvements to channel or lakeshore lands. The estimated cost of land rights, including a contingency factor of 10 percent, is broken down as follows:

a. Land value	\$ 39,400	e. Culverts (one)	\$ 590
b. Acquisition costs	4,380	f. Other (includes fencing,	
c. County bridges (two)	17,600	power poles, installa-	
d. Farm bridges (one)	3,300	tion services, etc.)	5,450
			<u>\$70,720</u>

#### Cost Allocation

All structures in this work plan with the exception of the lake outlet structure are for the single purpose of flood prevention. The lake outlet structure serves both flood prevention and fish and wildlife purposes. The costs of this structure were allocated to the two purposes



in the ratio of the costs for a single purpose structure for each purpose to the sum of those costs. The costs of the fish screens and bypass gate, estimated at \$18,675, are specific costs for fish and wildlife, and the costs of the remaining two gates, estimated at \$5,795, are specific costs for flood prevention. Of the remaining or joint costs, \$20,570 is allocated to fish and wildlife and \$28,410 to flood prevention. Cost allocation for the total project is shown on Table 2A.

### Cost Sharing

The total project cost is estimated at \$655,395. The total cost of structural measures, including \$65,060 for project administration, is estimated at \$504,170. Public Law 566 funds will pay approximately \$413,295, or about 82 percent, and other funds will provide about \$90,875, or 18 percent. Construction costs allocated to flood prevention will be borne by Public Law 566 funds; those allocated to fish and wildlife will be shared equally by Public Law 566 funds and other funds.

The following will be paid from Public Law 566 funds:

1. The construction cost of the flood gates, estimated at \$5,175; one half, estimated at \$8,335, of the construction cost of the fish screens and bypass gate; and 79 percent, estimated at \$34,545, of the remaining (joint) cost of the multiple purpose lake outlet structure.
2. The total construction cost of the channel, estimated at \$203,310.
3. The total construction cost of the water level control structure, expected to amount to \$29,020.
4. The total construction cost of the floodwater barrier, estimated at \$18,400.
5. The total construction cost, estimated at \$11,340, for improving the sink area.
6. Construction cost of the snow course and stream gage estimated at \$1,300.
7. The cost of engineering services expected to amount to \$39,440.
8. Project administration costs incurred by the Service, estimated at \$62,430.

The following will be borne by other than Public Law 566 funds:

1. The cost of technical assistance, estimated to be \$7,760, from regular appropriations of the Soil Conservation Service, and \$4,500 under the going program of the State Department of Natural Resources.
2. The cost of installing land treatment measures on watershed lands, estimated to be \$41,760 on cropland, and \$97,205 on woodland.
3. One-half of the construction cost of the fish screens and outlet gate, estimated at \$8,340, in the multiple purpose lake outlet structure, and 21 percent, estimated at \$9,185, of the joint costs in that structure.
4. Project administration costs incurred by the local sponsors, estimated at \$2,630.
5. The cost of acquiring land and water rights at an estimated cost of \$70,720.

Installation of the project will be over a five-year period, with the work of installing structural measures in the first two years following execution of the construction agreement, and the installation of land treatment measures continuing through the five-year period.

The following schedule shows the anticipated rate of expenditure of funds by fiscal years:

#### Schedule of Expenditure of Funds

Fiscal Year	Structural Measures		Land Treatment		Total
	PL 566 Funds	Other Funds	PL 566 Funds	Other Funds	
First	39,140	71,320	0	17,865	128,325
Second	374,160	19,550	0	30,245	423,955
Third	0	0	0	30,245	30,245
Fourth	0	0	0	30,245	30,245
Fifth	0	0	0	42,625	42,625
TOTAL	413,300	90,870	0	151,225	655,395



## EFFECTS OF WORKS OF IMPROVEMENT

### Land Treatment Measures

Land treatment measures on the uplands will serve to reduce sedimentation of the inlets to the lake, and will serve to maintain or improve the infiltration of precipitation in the watershed, thereby having a beneficial effect on stabilization of streamflow into the lake. Land treatment measures will also serve to reduce debris entering stream channels or the lake. Other measures will sustain present levels of fire protection and help prevent erosion.

The present gross erosion rate for the watershed is estimated at 1.2 tons per acre per year. The principal types are roadside and stream-bank erosion, with some sheet erosion on the flat valley bottoms. Selected land treatment measures will reduce erosion rates on the steeper upland slopes by an estimated 75 percent. Gully and roadside erosion will be reduced an estimated 80 percent and sheet and rill erosion will be reduced an estimated 30 percent.

The sediment entering Newman Lake amounts to an estimated 2.7 acre feet per year. Land treatment measures will reduce this figure to approximately 1.3 acre feet per year.

Most sediment deposition has occurred on two acres of land on the lower flood plain of Thompson Creek. The size of area damaged will be reduced by about 50 percent with the proposed land treatment measures in effect.

Thompson Creek is estimated to have an average annual sediment concentration of 250 ppm <sup>1/</sup> as it enters Newman Lake. Watershed land treatment measures to be installed are expected to reduce this sediment concentration to about 120 ppm.

The aggregate long term effects of these land treatment measures will be to reduce sediment discharge in the lake and on adjoining properties, and to assist in stabilizing wildlife habitat conditions in watershed lands. Secondary benefits to wildlife will occur on about 3,760 acres as woodland management practices are applied. An additional 3,200 acres of wildlife habitat will be preserved in its present condition for forest wildlife species.

Land treatment measures such as drainage field ditches and pasture and hayland management will make possible the realization of more intensive use benefits provided by the structural improvements. Other measures will prevent siltation of the floodwater disposal area and facilitate disposal of excess flood flows.

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<sup>1/</sup> ppm - parts per million

An effect of these measures will be to lessen the hazard of flood and sediment damages to farmlands south of the lake, resulting in general net increases in farm income. Lands now used for short season grain crops will be converted to conservation rotations, including improved hay and pasture crops. The resulting reductions in frequency and intensity of required cultivation will also result in decreases of erosion and sediment movement on these lands and in long term improvements to the soil resource. A decrease in the rate of sediment deposited in the disposal area will reduce maintenance costs in this area.

### Structural Measures

The structural measures will prevent damages from the 10 percent chance of occurrence storm, on cropland and from the 1 percent chance of occurrence storm for property around the lake. The channel will provide improved conveyance for floodwater into the sink area. The result will be to reduce floodwater damage on 870 acres of cropland below the lake and allow more intensive use of 660 acres of this land. About 332 acres may still be inundated by a one percent frequency flow. The water level control structure in the channel will control the water content of the 870 acres of peat soils and prevent excessive oxidation of these soils during low water periods. The lake outlet structure will control and reduce maximum lake elevations and prevent damage to lakeshore properties, along with 160 acres of cropland above the lake. Some silt and organic material will be removed from the sink area to allow a larger disposal area for the floodwaters. Evaluations made concerning this operation show no adverse effects as to possible pollution of the ground water supply.

The above structural measures are expected to largely prevent damages from flooding. The average damage reduction effected for all storms of more than 10 percent chance of recurrence is 95 percent.

Reduction of flooding on 765 acres of cropland will eliminate 460 acres of Type 1 wetlands now used by waterfowl during the spring migrations. A change of crop on 375 acres from oats to pasture grasses will reduce migrating populations of waterfowl by 80 percent nine out of every 10 years, compared to the same reduction of three out of every 10 years under present conditions. These waterfowl will remain within the Spokane Basin, since similar habitat is plentiful.

Raising the floodwater barrier and installing a new and larger outlet structure with fish screens will prevent trout from being washed away by floodwaters. As a result, fish will be planted in the lake about two weeks earlier, allowing fishermen to begin fishing at the opening of fishing season rather than several weeks later.

These structures will, in addition, permit the Washington State Department of Game to rehabilitate the lake and plant fingerlings instead of full-sized fish, when feasible, thereby increasing the trout population approximately fivefold. Increase in trout and earlier plantings made possible



will provide 58,000 additional man-days of fishing per year. The numbers of spiny-ray fish will be reduced as the lake is rehabilitated for increased trout. Numbers of each specie of fish will depend upon the type of lake management initiated by the Department of Game.

The proposed new outlet structure will allow the lake level to be maintained at a higher, more desirable elevation during the low water flow period of the summer months. This effect will be to enhance recreation and esthetic opportunities during this important period of the year.

The proposed structure will allow the passage of a flood flow equal to the one percent probability of recurrence with a maximum lake elevation not exceeding 2125.6 feet. Such an occurrence as well as more numerous lesser freshet flows are caused by early spring snow melt or rain in the watershed above the lake. These occurrences typically cause fluctuations of the lake level and flooding of low elevation land. Reduction of excessively high lake levels will decrease erosion of sand from beaches and lessen damages to docks and other facilities.

The project will decrease the incidence of flooding of roads and bridges, thus improving transportation in and out of the watershed. Crops and lakeshore property will be protected, improving the economic well-being of the watershed and surrounding area, as well as reducing the worry and anxiety connected with the loss of personal possessions. Management of the lake at a high elevation may cover with water some areas of the beach now exposed during late summer months.

The reduction of floodwaters will prevent septic tanks from flooding and exposing raw sewage on the surface. Thus, sewage formerly carried by these floodwaters will be prevented from entering and contaminating the lake. Areas where mosquitoes and other insects breed will be reduced.

There will be an approximate 2-year disturbance of muskrat habitat during project construction, accompanied by a loss of 2-1/2 acres of land consumed by the project and removal of 23 acres of uneven-aged ponderosa pine from the construction and excavation areas, causing some disturbance of wildlife habitat.

Gravel will be temporarily stockpiled along the edge of the channel until it is used for roadfill; this may involve some temporary effects on the esthetic properties of the area. There are also expected to be some minor temporary effects of noise and dust associated with the project construction activities.

Reduction of flood stages will result in reducing the amount of sediment, residue from agricultural and other activity, and other potential pollutants, now carried into the lake and outlet channel by floodwaters. Debris now washed onto beaches and fields will also be decreased.

A deeper lake on a year around basis will lessen the number of aquatic plants, such as the water lily and cattail, seen on the surface of Newman Lake each year. A stabilized lake level will encourage certain aquatic vegetation such as pond weeds. However, the latter will be limited to a narrow band at the edge of the lake. Other short term effects may be associated with the two year construction period. These will heal as re-vegetation takes place.

Damages from a 10 percent chance of recurrence flood, such as the one in 1969, would be reduced from approximately \$44,500 to an insignificant amount with the project in place. A flood having a chance of occurring once in 100 years would temporarily inundate 330 acres at the south end of the lake. This temporary inundation would result in \$4,300 worth of damage or \$268 each year figured over a 100 year period. Damages from the same flood would be less than \$100 annually over the 100 year period with proper management.

The construction phase of the project is expected to provide five man-years of local employment for each of two years. Once the project is installed, operation and maintenance will require about one-half man-year of local employment every year for the life of the project. The increased recreation and fishing seasons will mean approximately 48 more man-weeks of employment per year for service enterprises associated with recreation. A reduction in flooding of cropland will allow the farmers affected to improve the economic efficiency of their units, thereby assisting their continuance in farming. Secondary economic impacts from additional farming supplies needed and from additional income will be largely felt in Spokane. Impacts from additional fishermen and other recreationists will be split between the watershed and Spokane.

The primary beneficiaries of the project will be seven farmers and the 1,800 full- and part-time residents around the lake. Other beneficiaries will include the fishermen and other recreationists from outside the watershed.

Recreational use of the lake is expected to increase with the passage of time. Greatest use of the lake will occur in the summer months. This expectation is based on three major factors: gradually increasing population and demand for water-based recreation, anticipated establishment of a state park facility and other public access facilities on the lake-shore, and improved fishery expected to be provided in part by this project. Recreation use is likely to be picnicking, swimming, other water sports, and fishing. The increase in fishery is expected to develop over a 15-year period; and other recreation uses will likely increase similarly during this time period. The increased use is not expected to cause deterioration of the water quality of the lake because state regulations will require that adequate waste disposal systems be installed with new facilities, and other improvements or operations be implemented if required, to protect the lake as the hazard from loadings increase through the years.



## PROJECT BENEFITS

Benefits to be expected from the project are: (1) an approximate 95 percent reduction in average annual floodwater damages to agricultural lands and lakeshore properties from storms occurring more frequently than 10 percent of the years; (2) increased income to agricultural lands as a result of removal of the floodwater hazard; and (3) an increase in fish and wildlife habitat and incidental recreation benefits. There will also be secondary benefits in the form of more jobs and higher incomes for residents of the watershed as a result of these three primary benefits.

Present average annual damages total \$38,485. The structural works of improvement and land treatment measures will reduce these damages by \$36,275, leaving residual average annual damages of \$2,210 (see tables 5 and 6).

Benefits to fish and wildlife result from both flood prevention and fish and wildlife measures, through prevention of loss of fish and improved capability for management of the fishery resource. Fish and wildlife benefits estimated at \$22,400 will accrue from fish and wildlife improvement measures. Additional benefits estimated at \$22,400 are fish and wildlife benefits incidental to flood prevention.

Local secondary benefits stemming from and induced by the project total \$9,040 annually. Secondary benefits from a national viewpoint were not considered pertinent to the project. In addition, there are unevaluated benefits to personal health and esthetic properties in connection with the lake area.

## COMPARISON OF BENEFITS AND COSTS

The annual equivalent of benefits expected to result from the structural works of improvement is \$114,425. The equivalent average annual cost of structural measures (including all operation, maintenance, and replacement costs) will be \$43,315 (tables 4 and 6). This relationship of benefits to costs provides a ratio of 2.6 to 1. The ratio of benefits to costs without secondary benefits included is 2.4 to 1.

## PROJECT INSTALLATION

This plan will be carried out as a joint undertaking of nonfederal sponsors and the federal government. Nonfederal interests include individual landowners and operators, Spokane County Board of Commissioners for the Newman Lake Flood Control Zone District, Spokane County Conservation District, and the Washington State Game Commission. These sponsoring nonfederal organizations will make a decision on whether to have the Soil Conservation Service administer all project construction contracts at a later date.

Land treatment measures installed on private property is the responsibility of the individual landowner. Technical assistance for installing these measures will be furnished by the Spokane County Conservation District.

Newman Lake Flood Control Zone District, (Spokane County Board of Commissioners) is designated by the other sponsoring nonfederal organizations as their agent to represent their interests during the project installation. The Newman Lake Flood Control Zone District will acquire the necessary land rights through negotiation or by exercise of eminent domain, and will make available the nonfederal share of the cost of installing the structural measures, with the exception of those costs provided by the Washington State Game Commission.

Spokane County, through the Board of County Commissioners, will provide and maintain a portion of the rights-of-way in the form of necessary easements, roads, and bridges over the improved channel, and will maintain such other county-owned property as is significant to the project. In addition, they will decide whether to have the Soil Conservation Service administer all project construction contracts before the signing of the project agreement(s).

Spokane County Conservation District, organized under Washington State law, is empowered to enter into agreements and contracts, to sue and be sued, to carry out soil and water conservation operations, and to apply soil conservation treatment through district-cooperator agreements within the boundaries of the district. Spokane County Conservation District will continue the going program of the district within the watershed at the rate which existed prior to the development of this work plan, and will execute agreements with owners of private lands for installation of land treatment measures.

Washington State Game Commission, through the Department of Game, will be responsible for the nonfederal share of the structural measures cost allocated to fish and wildlife. They will provide a portion of their share of this cost by furnishing and installing the fish screens with gears, motors, power supply hookup and the gate for the fish screen bypass on the base prepared by the contracting organization. The quantity and value of such work will be determined by mutual concurrence immediately prior to the signing of the appropriate agreement and will be set forth in the project or engineering agreement. The Commission will continue to provide and maintain state-owned public access to Newman Lake, and will manage and protect fish and wildlife of the area as provided by state law.

The Soil Conservation Service, USDA, has departmental leadership for the Watershed Protection and Flood Prevention Act (PL-566) and, in addition,



provides technical services to the Spokane County Conservation District through an existing cooperative agreement. The Service will provide the federal share of construction cost, including the cost of installation of the snow course and stream gage in accordance with BOB circular A67, engineering services, and project administration for installation of this project upon completion of appropriate agreements, and will continue to provide technical assistance for land treatment measures under the cooperative agreement with the Spokane County Conservation District.

Responsibilities of other state and local organizations, and federal agencies participating in this work plan are:

The Forest Service, USDA, exercises general administrative supervision and competency over forested portions of the watershed. The Forest Service, through the Washington State Department of Natural Resources, will maintain liaison with the sponsors and assist in appropriate revisions of this work plan. The going rate of supervision and assistance of forest lands will be continued.

The Farmers Home Administration, under provisions of PL-566, administers credit and loan provisions of the Act. The FHA administrator will give high priority to requests for credit assistance in carrying out structural portions of the work under this work plan. Local interests have indicated they do not wish to apply for a loan for project installation.

The Washington State Department of Ecology is the agency designated by the governor to take the leadership in coordinating assistance by state agencies to watershed projects. The department will give priority to the Newman Lake Watershed, and will consult with the sponsors and assist them technically and financially on behalf of the state government to the extent practical.

The Washington State Department of Natural Resources manages state-owned forest lands within the watershed, provides technical forestry assistance to the project area, and undertakes primary responsibility for protecting the forest areas from fire damage. The Department of Natural Resources concurs in this plan.

The merchantable timber on the lands managed by the Department of Natural Resources is about 100 years old. The only cut contemplated in the near future will be a sanitation cut. Fire, insect, and disease control are the primary functions of the department in the management of these lands.

The accessibility of a section of state-owned land on the southeast side of the watershed gives it special consideration for development.



Presently, there is a grazing lease on a portion of this land, and an application is on file to lease the remainder. The Department of Natural Resources is developing a recreational site here for handicapped people. A half mile of recreation road, a series of small dams to create shallow pools, and picnic and campground facilities, are some of the improvements associated with this project.

The Washington State Department of Parks manages the Mount Spokane State Park. Lands in this park extend along the ridgetops at the head of the watershed. Present plans are to leave these lands undeveloped except for some trail construction. The adjoining state lands may be incorporated into the park system when expansion is needed.

The Spokane County Rural Development Committee will have enlarged opportunities after the watershed project is installed, to assist farmers and rural dwellers in making full use of land, water, and timber resources for agricultural, recreational, and industrial development. Agencies participating in the Rural Development Program will be called upon by the sponsors, as feasible, for technical assistance and capital for the purpose of achieving more efficient agricultural operations, training the unemployed, establishing rural industries and businesses, and providing public facilities for health, transportation, recreation, and general welfare. This assistance is expected to be furnished by practical rescheduling of going programs of the agencies involved.

#### Installation of Land Treatment Measures

Land treatment measures will be installed over the five-year project period by individual landowners, with technical assistance provided by the State Department of Natural Resources and the Soil Conservation Service, cooperating with the Spokane County Conservation District. This five year period is needed because changes in rotations and cropping patterns will not take place until structural measures are installed. The Department of Natural Resources provides technical assistance on 21,105 acres of forest lands. No funds for accelerating technical assistance are requested, due to the adequacy of the present program.

To provide technical assistance during the project period for the installation of land treatment measures, the estimated sum of \$7,760 will be used by the Soil Conservation Service in its regular watershed area program of assistance through the Spokane County Conservation District.

The acreages of land treatment measures outlined in the following table are felt to be realistic and are consistent with the historical rate of planning in the watershed. The annual increments shown are average annual estimates and not conservation goals.

Type of Land	:	Quantities to be installed, by Years						:Remaining Years
		Unit	: First Year	: Second Year	: Third Year	: Fourth Year	: Fifth Year	
Cropland	ac.	61		122	122	122	183	
Forest Land	ac.	1,320		1,640	2,440	2,640	3,960	

### Installation of Structural Measures

Project structural measures will be installed during a two-year period. Construction work is expected to proceed concurrently on all phases of the structural measures. The Spokane County Commissioners, for the Newman Lake Flood Control Zone District, will decide whether or not to have the Soil Conservation Service serve as the contracting agency at a later date.

### FINANCING PROJECT INSTALLATION

Funds appropriated under the authority of PL-566, 83rd Congress, 68 Stat. 666, as amended, will be used to pay the PL-566 share of project costs. This work plan does not constitute a financial document for the obligation of either federal or other funds. Financial or other assistance to be furnished by the Service in carrying out the plan is contingent upon the appropriation of funds for this purpose.

The Newman Lake Flood Control Zone District, through the Spokane County Commissioners, has the power under state law to plan, install, operate, and maintain improvements for protection from overflow and for similar beneficial purposes. Costs are converted into assessments levied against benefited lands, and moneys necessary to meet the costs of installation, operation, and maintenance can be secured by these assessments. The district will furnish needed land rights prior to construction and may exercise the right of eminent domain for necessary purposes, and may sue and be sued in the superior court of Spokane County.

The State Game Commission, through the Washington Department of Game, will provide a portion of their share of the cost by furnishing and installing the fish screens with gears, motors, power supply hookup and the gate for the fish screen bypass, on the base prepared by the contracting organization. The quantity and value of such work will be determined by mutual agreement immediately prior to the signing of the appropriate agreement and will be set forth in the project or engineering agreement.



## PROVISION FOR OPERATION, MAINTENANCE, AND REPLACEMENT

Operation and maintenance of land treatment measures will be the responsibility of the individual owners of the properties on which the measures are installed. Technical assistance is available from the Spokane County Conservation District.

It is planned that the elevation of the lake will be lowered each winter in anticipation of spring freshets and unusual precipitation events that might cause flood damage. Normally, the lake surface will be lowered about two feet to a maximum elevation of 2123.6 feet, USGS, for this purpose. The radial gate outflow will be adjusted to match inflow to a maximum rate of 175 cfs. The storage available by this drawdown of the lake, together with outflow management, will pass the flood event having a probability of recurrence once in 10 years without predictable damage to farmlands or property.

It is planned that additional lowering of the lake surface elevation (below 2123.6 feet) may be undertaken if an exceptionally heavy winter snow accumulation indicates the possibility of spring flooding. Snow course measurements, giving snow depth, water content, and ground conditions, will be used to reinforce practical judgment in determining advisability of additional lowering of the lake surface below the standard winter drawdown elevation. Measurements of a snow course in the watershed above Newman Lake will be made monthly during the winter snow build-up and meltdown periods of the year, to provide lake management information. In the event snow conditions warrant, the lake surface level would be lowered to a maximum elevation of 2122.6 feet, USGS datum, and the additional regulation thus provided would pass the flood having a one percent chance of recurrence with little or no damage to property or farmlands.

Physical factors limit control of low water. The meager flow into the lake in the summer months may not be sufficient to offset evaporation losses. However, the installation of a gated structure will allow local interests to manage the water for optimum levels obtainable under varying climatic conditions. Sufficient flow is available each spring season to assure raising the lake to its optimum elevation during the early spring months.

Operation and maintenance of the channel, lake outlet structure, except the fish screens, floodwater barrier, channel water level control structure, and sink, will be by the Newman Lake Flood Control Zone District, through the Spokane County Commissioners, at an estimated cost of \$5,145 annually. This maintenance and operation estimate includes allowances for control of vegetation, sediment, painting, cleanout, and repair. In addition, local sponsors will expend an estimated \$300 per year for



snow course and stream gage measurements during periods of accumulation and melting of snow. This will include flow forecasting after sufficient historical data has been obtained for the purpose.

The costs of operating and maintaining the fish screens and base, including operating power, and costs of replacing the screens, motors, and gears, and the management of the fishery resource, will be borne by the Washington State Department of Game. As a part of the management of the fishery resource, the Department of Game will, as feasible, remove trash fish from the lake and restock with trout, together with other management to maintain the fishery. These operation and maintenance costs are estimated to be \$3,165 annually.

Specific operation and maintenance agreements will be executed prior to the issuance of invitations to bid for any construction contract. The sponsors and the Soil Conservation Service will jointly make an inspection of construction work annually, after unusually severe floods, and after the occurrence of any other unusual condition that might adversely affect the structural measures. Appropriate officials from the Washington State Department of Ecology will be invited to participate in these inspections. Joint inspections will continue for three years following installation of such structures. Inspections after the third year will be made annually by the sponsors.

Land treatment accomplishments will be reviewed annually, and needed actions will be taken to provide technical assistance to encourage continued and timely progress toward completion of this phase of the project.

TABLE 1 - ESTIMATED INSTALLATION COST  
Newman Lake Watershed

Installation Cost Item	Number		Estimated Cost (Dollars) <sup>1/</sup>					TOTAL
	Unit	Non-Fed. : Land	PL-566 Funds		Other			
			Non-Federal Land : SCS <sub>3/</sub>	Total : FS <sub>3/</sub>	Non-Federal Land : SCS <sub>3/</sub>	Total : FS <sub>3/</sub>		
LAND TREATMENT								
Land Areas <u>2/</u> Cropland	Acres to be treated	610 12,000	610 12,000		41,760	97,205	41,760 97,205	41,760 97,205
Forest Land								
Technical Assistance					7,760	4,500	12,260	12,260
TOTAL LAND TREATMENT					49,520	101,705	151,225	151,225
STRUCTURAL MEASURES								
Construction								
(M) Channel Work <u>4/</u> Channel Water Level	Miles	3.8	3.8	204,310	204,310			204,310
Control Structure	ea.	1	1	29,020	29,020			29,020
Floodwater Barrier	Miles	1.4	1.4	18,400	18,400			18,400
Sink Preparation	Acres	28	28	11,340	11,340			11,340
Snow Course	ea.	1	1	300	300			300
Lake Outlet Structure								
Radial & Vertical gates	ea.	1	1	5,175	5,175			5,175
Fish Screens & Gate	ea.	1	1	8,335	8,335		8,340	16,675
Remainder of Structure	ea.	1	1	34,550	34,550		9,180	43,730
Subtotal Construction				311,430	311,430		17,520	328,950
Engineering Services				39,440	39,440			39,440
Project Administration								
Construction Inspection				16,440	16,440			16,440
Other				45,990	45,990		2,630	48,620
Subtotal Administration				62,430	62,430		2,630	65,060
Other Costs								
Land Rights							70,720	70,720
Subtotal-Other							70,720	70,720
TOTAL STRUCTURAL MEASURES				413,300	413,300		90,870	504,170
TOTAL PROJECT				413,300	413,300		101,705	655,395

1/ Price base 1973

2/ Includes only areas estimated to be adequately treated during the project installation period. Treatment will be accelerated throughout the watershed, and dollar amounts apply to total land areas, not just to adequately treated areas.

3/ Federal agency responsible for assisting in installation of works of improvement.

4/ (M) Manmade ditch or previously modified channel.





TABLE 1A - STATUS OF WATERSHED WORKS OF IMPROVEMENT  
(at time of Work Plan preparation)

Newman Lake Watershed, Washington

Measures	:	Unit	:	Applied to Date	:	Total Cost of Improve.
<u>LAND TREATMENT</u>				(Dollars) <u>1/</u>		
<u>Cropland</u>						
Conservation Cropping System	ac.			1,838		55,140
Ponds	no.			6		9,000
Irrigation Water Management	ac.			377		49,010
Pasture & Hayland Management	ac.			680		20,400
Open Channel	ft.			5,740		3,445
Drainage Field Ditches	ft.			5,065		1,520
<u>Wildlife</u>						
Wildlife Upland Habitat Mgmt.	ac.			8,540		8,540
<u>Woodland</u>						
Woodland Improved Harvesting	ac.			741		3,705
Woodland Improvement	ac.			230		34,500
Woodland Access Roads	ft.			196,537		11,790
Proper Grazing Use	ac.			2,610		2,610
Fire Protection	ac.			21,104	<u>2/</u>	5,485
Fire Protection Roads	mi.			17		17,000

STRUCTURAL MEASURES 3/

TOTAL	222,145
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1/ Price base: 1973

2/ Cost per year.

3/ All structural measures installed at least 10 years prior to Work Plan preparation.

Date: September 1974



TABLE 2 - ESTIMATED STRUCTURAL COST DISTRIBUTION

Newman Lake Watershed, Washington

(Dollars) 1/

Item	: Installation Cost, PL-566 Funds:				: Installation Cost, Other Funds:			Total : Installa- tion : Cost
	: Construc- tion :	: Engi- neering :	: Total : PL-566 :	: Total : Construc- tion :	: Land : Rights :	: Total : Other :		
Channel Work								
97+51 to 118+64 (0) 2/	14,000	1,690	15,690		3,845	3,845	19,535	
118+64 to 290+00 (M) 2/	189,310	22,830	212,140		3/ 51,855	51,855	263,995	
Channel Water Level Control Structure	29,020	3,480	32,500				32,500	
Floodwater Barrier	18,400	2,210	20,610		890	890	21,500	
Sink Preparation	11,340	1,360	12,700		14,130	14,130	26,830	
Snow Course & Stream Gage 4/	1,300		1,300				1,300	
Lake Outlet Structure								
Radial & Vertical Gates	5,175	620	5,795				5,795	
Fish Screens & Bypass Gate	8,335	2,000	10,335	8,340		8,340	18,675	
Remainder of Structure	34,545	5,250	39,795	9,185		9,185	48,980	
Subtotal	311,425	39,440	350,865	17,525	70,720	88,245	439,110	
Project Administration			62,430			2,630	65,060	
GRAND TOTAL	311,425	39,440	413,295	17,525	70,720	90,875	504,170	

1/ Price base: 19732/ Type of channel before project: (0) - None or practically no defined channel; (M) - Manmade ditch or previously modified channel.3/ Includes \$110 for relocating two pumphouses; \$1,100 for relocating underground cable; \$825 for re-locating five power poles; installation services on bridges and culverts, \$2,150; administration of contracts for bridges, \$215; and fencing, \$1,050.4/ Includes \$1,000 for installing a stream gage in the outlet channel and \$500 for installing a snow course on the upper watershed.Date: September 1974





TABLE 2A - COST ALLOCATION AND COST SHARING SUMMARY

Newman Lake Watershed, Washington

(Dollars) 1/

Item	COST ALLOCATION		COST SHARING			
	Purpose		PL-566			
	Flood	Fish & : Preven.:Wildlife: Total	Flood	Fish & : Preven.:Wildlife: Total	Flood	Fish & : Preven.:Wildlife: Total
Channel Work, Channel Water Level Control Structure, Floodwater Barrier, Sink Preparation, and Snow Course and Stream Gage	365,660	365,660	294,940	294,940	70,720	70,720
Lake Outlet Structure Radial & Vertical Gates	5,795	5,795		5,795		
Fish Screens & Bypass Gate	18,675	18,675	10,335	10,335	8,340	8,340
Remainder of Structure	28,410	20,570	28,410	11,385	9,185	9,185
GRAND TOTAL	399,865	39,245	439,110	329,145	21,720	17,525
				350,865	70,720	88,245

1/ Price base: 1973

Date: September 1974





TABLE 3A - STRUCTURE DATA

## CHANNELS

Newman Lake Watershed, Washington

Channel (No. or Name	Station or Reach	Drain- age Area :Sq. Mi.	Capacity cfs :Req'd: Design	Water: Hy- draulic Sur- face Grad. (ft/ft) :Elev.:	Channel Dimensions : Depth: Side (ft) : (ft):Slopes:	"n" Value : As Built : Aged :	Velocities : As Built : Aged :	Excava- tion : Cu. Yds. Built : Aged :	Type of Work	Type of Project	Channel prior to Project	Flow Condition prior to Project		
Outlet	97+51 to 290+00	29	175	175	12	Varies 1-1/2:1	.35	.25	2.0	2.57	200	II	M	I

(1000)

1/ II - Enlargement of existing man made channel or stream.

2/ M - (1902) Man made ditch (date of original major construction in parenthesis).

3/ I - Intermittent - continues flow through some seasons of the year, but little or no flow through other seasons.

September 1974



TABLE 4 - ANNUAL COST

Newman Lake Watershed, Washington

(Dollars) 1/

Evaluation Unit	: Amortization : Operation & : : of Installa- : Maintenance : : tion Costs <u>2/</u> : Costs <u>3/</u> :	Total
All Structural Measures	30,225                      8,610	38,835
Subtotal	30,225                      8,610	38,83
Project Administration		4,480
GRAND TOTAL		43,315

1/ Price base: 1973 prices

2/ Amortized 100 years at 6-7/8 percent.

3/ Includes \$3,165 for operation, maintenance, and replacement of structural measures for fish and wildlife purpose, and \$300 for O&M on the snow course.

Date: September 1974





TABLE 5 - ESTIMATED AVERAGE ANNUAL FLOOD DAMAGE REDUCTION BENEFITS

Newman Lake Watershed, Washington

(Dollars) 1/

Item	: Estimated Average Annual Damage :		Damage Reduction Benefit
	: Without	: With	
	: Project	: Project	
Floodwater			
Crop and Pasture <u>2/</u>	8,520	300	8,220
Property around Lake	18,210	1,160	17,050
Roads	2,700	350	2,350
Fish and Wildlife	4,755	0	4,755
Subtotal	34,185	1,810	32,375
Sediment			
Debris	400	100	300
Sediment	200	50	150
Subtotal	600	150	450
Erosion	200	50	150
Subtotal	200	50	150
Indirect	3,500	200	3,300
Subtotal	3,500	200	3,300
TOTAL	38,485	2,210	36,275

1/ Price base: 19732/ All crop damage figures adjusted to normalized prices.

Date: September 1974





TABLE 6 - COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

Newman Lake Watershed, Washington

(Dollars)

Evaluation Unit	AVERAGE ANNUAL BENEFITS 1/									
	Damage :	More :	Inciden.:	Inciden.:	Fish and :	Second- :	Total :	Average :	Benefit-	
	Reduction:	Intensive:	Recrea-	Fish and:	Wildlife:	ary :	Benefits:	Annual :	Cost	
	2/	Land Use :	tion :	Wildlife:	Wildlife:		Cost 3/		Ratio	
Channel Work;										
Channel Water Level										
Control Structure;										
Floodwater Barrier;										
Sink Preparation &										
Lake Outlet Struc-										
ture with Fish										
Screens & Base	35,675	18,395	6,515	22,400	22,400	9,040	114,425	38,835	2.9:1	
								4,480		
Project										
Administration										
GRAND TOTAL	35,675	18,395	6,515	22,400	22,400	9,040	114,425	43,315	2.6:1	

1/ Price base: 1973. All crop damage figures adjusted to normalized prices.

2/ In addition, it is estimated that land treatment measures will provide flood damage reduction benefits of \$600 annually.

3/ Average annual costs from table 4.

Date: September 1974



## INVESTIGATIONS AND ANALYSES

### Project Formulation

Project objectives of the Sponsoring Local Organization determined the extent of the investigations and analyses necessary to comprehensive planning of the Newman Lake Watershed.

Objectives of the sponsors included the reduction or elimination of floodwater damages to agricultural lands and lakeshore properties, and the protection and enhancement of the lake's fishery resources.

Investigations were made to determine land treatment and structural measures needed to accomplish these objectives at the lowest overall cost.

### Land Treatment Investigations

Land treatment in the Newman Lake Watershed will consist mainly of practices which will retard sedimentation rates and practices which will re-establish pastures that have deteriorated because of excessive flooding. These necessary measures will consist of seeding of grasses and legumes, pasture and hayland plantings, and some supporting practices so that land will not be without cover more than a minimum length of time.

There are 21,104 acres of forest land in the watershed, 19,394 acres of which are farm woodlands. Since the biggest source of erosion is roads, their extension and maintenance is an important consideration. During the next 10 years, the Department of Natural Resources expects to spend \$500 a year on protective work on their 17 miles of roads within the watershed, and \$400 a year to build four miles of additional roads. Many miles of roads have been and are being installed by private owners to gain access for fire suppression, and to allow salvaging of white fir trees threatened by the engraver beetle. The owners will be encouraged to properly locate these roads with respect to terrain, and to provide adequate safeguards to prevent erosion.

Owners who harvest their timber will be encouraged to take proper conservation measures to protect the timber and water resources.

A total of about 3,200 acres will be preserved or managed as habitat for native upland wildlife species. Primarily, this will consist of residual benefits derived from woodland management practices, such as seeding following timber harvesting and access road construction.

The Washington State Department of Game is responsible for the protection and enhancement of public fisheries in the lake, and will provide management of the lake waters for that purpose. The department will



also assist with management of wildlife species on the uplands.

## Engineering Investigations

### General Considerations

The primary basis for determining structural measures included in this Work Plan was to provide the maximum level of flood protection within the limits of sound economic and engineering practice. Project measures were selected to provide the maximum net benefits, with due consideration of probable future needs. Environmental considerations were given the same weight as engineering and economics in formulation of the plan.

The costs of various alternatives in design were considered without regard to the relative federal and nonfederal shares of the cost. Unit prices were selected on an experience basis from recent construction contracts deemed applicable. Estimates of construction cost, increased by contingency factor of 15 percent, were used in preparing appropriate tables for the Work Plan.

An engineering inventory of existing structures and physical conditions was begun in the summer of 1968, and an engineering survey was conducted to establish horizontal and vertical controls over the damage area.

The 1969 spring runoff provided an excellent opportunity to study the effects of high water under field conditions and to establish rating curves for hydraulic measurements, such as the infiltration capability of the sink area.

Geologic investigations made in 1970 served to establish foundation adequacy, sink capacity, and channel stability (see "Geologic Investigations").

Preliminary observations identified three distinct but related areas of floodwater damage:

1. Agricultural lands below Newman Lake,
2. Agricultural lands tributary to Newman Lake, and
3. Shorelands of Newman Lake proper.

### Outlet Channel

Studies indicated the outlet channel of Newman Lake has inadequate capacity to convey floodwater flows in its existing condition. The profile survey of the existing channel indicates a one-foot reverse grade in the initial 14,000 feet, as well as reaches of inadequate channel cross section. A remodeled channel, with a profile grade of

0.0005 foot per foot of slope to sustain flow, requires an additional maximum cut of approximately 8.0 feet. However, a remodeled outlet channel only to convey floodflows would result in induced damages to lakeshore lands as well as to agricultural lands below the lake. These considerations led to inclusion of flow controls in (a) the channel reach near station 185+80, and (b) upstream at the lake outlet near station 97+51. Improvements thus consist of selected interrelated flow control structures and channel work.

Consideration was given to alternate channel designs to provide the required floodwater protection. The selected channel is planned to have a bottom width of 12 feet, an average gradient to 0.0005 foot per foot, and a side slope of 1.5 feet horizontal to 1.0 foot vertical. Velocity in the channel with the maximum design flow will be two feet per second. The existing channel has side slopes that vary between 1.0 foot and 1.5 feet horizontal to 1.0 foot vertical. Deep borings in this area indicate that the underlying materials are similar to sands and gravels now exposed on the channel bottom and banks. The design capacity of the selected channel is 175 cubic feet per second. This design capacity was based primarily on the capacity of the sink area, and channel side slopes selected were based on considerations of suitability and economy.

#### Channel Water Level Control Structure

Improvement of the existing channel could cause excessive lowering of the water table in the farmlands below the lake if some control were not provided. A water control structure in the channel is needed to keep summer and fall water table elevations high enough in the farmland area so that organic soils will not subside at an accelerated rate after channel remodeling. This structure is located near the boundary between the peat and mineral soils. Drilling indicated stable foundation conditions exist at this site.

#### Lake Outlet Structure

Remodeling of the outlet channel by itself would induce adverse effects on the elevation of Newman Lake during seasonal periods of low inflow and cause damage to properties in and around the lake. Consideration of these effects indicated the need for a flow control structure at the lake outlet that would allow management of lake volume (and elevation) with a degree of independence from the lower agricultural lands. The lake outlet structure selected is provided with fish screens and trash rack. The location is such that foundation conditions are adequate.

A study was made to select a lake outlet structure that would provide opportunity for management of lake volume (and elevation) to minimize damages from high water flows and at the same time permit retaining optimum elevation of the lake during periods of low flows.



It is planned that snow course measurements during periods of snow accumulation and snowmelt in the upper watershed will be used to guide practical aspects of management. Melting of the winter snowpack is the cause of floods. It is found that control of lake storage in anticipation of and during the spring snowmelt, in conjunction with an improved outlet channel, can prevent most of the damage that otherwise will result from storms having a probability of recurring at least once in 100 years.

Normal management will lower the winter elevation of the lake two feet below summer elevations. Lake storage thus provided will allow passing a flood having a probability of recurring once in 10 years, with a maximum outlet channel flow of 175 cubic feet per second, without predictable damage.

Similarly, in years of exceptionally heavy snow accumulations, the lake will be lowered three feet during winter and early spring months through management of the lake outlet structure. The additional lake storage volume thus provided will allow passing a floodflow having a probability of recurrence once in 100 years, with a maximum channel outflow of 175 cubic feet per second, without predictable damage.

In each case, after the danger of flooding is past, the lake outlet structure will be progressively closed, allowing the lake to attain optimum summer elevation and thus mitigate the effects of less than desirable lake elevations during seasonal dry weather that would otherwise result from the improved conveyance capacity of the lake outlet channel.

A study was made of flooding conditions that might result in the unlikely absence of all management of lake volume or elevation. Alternate emergency outlet weir lengths were considered in order to give protection to both lake property and farmlands. A fixed emergency weir having an effective length of 75 feet and an elevation of 2126.0 feet, "USGS datum, was selected for inclusion in the lake outlet structure. Providing this weir will serve to limit damages, in the total absence of expected management of lake volume and elevation as previously described.

While many benefits are obtainable from proper management of the lake outlet structure in preventing flood damage and in maintaining the lake elevation and its outflow at optimum condition, there exists a remote possibility of no management, or faulty management. The worst condition would be a major flood occurring at a time when the lake is at its maximum elevation. Under these conditions, the fail-safe nature of the discharge by the emergency weir was assessed. Under these unlikely conditions, a large portion of the benefits remain.

In the absence of any management of gated controls, flows resulting from a flood event of a size having a recurrence probability of once in 10 years will pass over the emergency weir, resulting in a lake elevation



not exceeding 2126.9 feet. A flow of this (10-year) magnitude will also be confined in the outlet channel, provided the water level control structure in the channel (station 186+00) is open. If, through further oversight, the water level control structure is left in a closed position, temporary flooding of a quiet, progressive nature may cover up to 840 acres of farmland adjacent to the channel.

If a flood event of a size having a recurrence probability of once in 100 years occurs in the absence of management, the flood will pass over the emergency weir, causing the lake level to rise to an elevation less than 2127.1 feet and causing, in addition, temporary flooding of cropland adjacent to the channel.

Under project conditions, in neither the 10-year nor the 100-year flood occurrence will there be unusual or abrupt hazard to life or property. Floodwater will gradually inundate lands to a relatively shallow depth permitting protective measures to be undertaken to limit damages. Since flooding will occur gradually over a period of several days, the complete absence of protective measures and the total absence of desirable management is considered very unlikely.

Active and faulty management, such as ill-advised abrupt and extreme opening of gated controls during a time when the lake elevation is high, could result in a surge of flow into the outlet channel. The initial high velocity of this flow could result in local channel erosion, but the velocity of the surging flow would be quickly dissipated. It would cause only gradual inundation of lower-lying farmlands to the extent and for the duration that such induced flow might exceed the conveyance capacity of the channel. Damages thus would consist mainly of increased maintenance costs on the channel, moderate injury to crops, depending on the season and local circumstances, and possible effects caused by lowering the lake elevation below a desirable level.

Other possible types of faulty management, such as delay in closing gated controls after peak runoff and in response to diminished inflow, are not likely to cause other than variable delays in attaining desired summer lake elevations. Such delays, unless of extreme duration, are not likely to result in failure to obtain desired summer lake elevations, since inflow into the lake continues at a gradually diminishing rate throughout the summer.

It is planned that the lake outlet control structure will be fenced and that controls will be locked to prevent unauthorized manipulation of controls, and to prevent trespass, thus aiding in public safety.

#### Floodwater Barrier

Studies indicate that the floodwater barrier now existing along the south edge of the lake should be increased in cross section and made uniform in height. The existing floodwater barrier was observed

frequently during high water stages to determine its adequacy, construction, durability, and imperviousness.

The selected plan provides that the existing barrier will be raised to a uniform elevation of 2128.0 feet, and the top widened to 14 feet. Side slopes selected are 3.0 feet horizontal to 1.0 vertical. Drilling in the barrier location indicates that the peat soil is of varying depths but generally in excess of 25 feet. The present "dike" functions well, and it was decided that the improvement should be constructed of the same peat materials. Moderate seepage of water through this barrier is considered normal, and does not induce piping or other damage by reason of its low hydraulic gradient and velocity.

Mineral soils are not considered suitable for the fill, as their greater unit weight would cause excessive settlement. The barrier will be built from side borrow, using the peat soils which have a low unit weight and contain large quantities of Reed canarygrass rhizomes. The canarygrass will form a dense protective sod within a year.

The channel formed from the borrow area will be utilized to convey water which may seep through the barrier to the main outlet channel. Care will be exercised to shape the borrow area to provide a suitable channel.

#### Sink Area

Adequacy of the sink area for disposal of design storm flows was determined by observations during the 1969 spring runoff, and by geologic mapping and subsurface explorations.

A staff gage on a rated section of channel provided outflow measurements during the observed runoff. An additional staff gage in the sink area, and topographic mapping was used to construct a stage-area curve. It was observed that 24 acres of the sink area dissipated the flow of 102 cubic feet per second entering the sink.

The selected plan is to provide a 34-acre area for dissipation of unwanted water, and to improve the infiltration rate of the sink by removing 12,000 cubic yards of relatively less pervious material from the surface of the permeable gravels. Material thus excavated is to be formed onto waste disposal areas around the margin of the sink. The improved sink is estimated (geologic investigation) to have a disposal capacity of 540 acre-feet per day. The sink thus is adequate to handle the flow of a storm with a recurrence frequency of once in 100 years without lake storage management (fail-safe condition).

#### Hydrology Investigations

Newman Lake Watershed was studied intensively from the spring of 1968 to the summer of 1970. A continuous-recording water stage recorder



was installed to record lake elevations, and a staff gage was installed to insure the accuracy of the recording gage.

A staff gage was installed in the farm area subject to flooding, to assist in determining the volume of water stored in the flooded area. The acreages flooded were carefully measured and related to the elevation readings of the staff gage.

A staff gage was set in a uniform section of the outflow channel below the farmlands and above the sink area. Current meter measurements were made at varying volumes of flow, and a rating curve was made for the site. Staff gage readings were made frequently throughout the runoff period and accurate outflow quantities were determined for the runoff period.

The sink was surveyed to determine the size and topography of the area. A staff gage was installed to record the water levels and area covered, and to assist in determining infiltration rates.

A regional stream study was made, using six similar neighboring streams with several years of record measured by the U.S. Geological Survey. These streams provided a good correlation and indicated that the snow-melt runoff which provided the peak flows on all of the streams was approximately a 10 percent frequency of occurrence event; the average one-day peak flow for these streams was nine percent; and the 10-day average flow was an eight percent frequency of occurrence event. The snowfall in Spokane and surrounding areas in the winter of 1968-1969 was of record proportions and gave credence to the "one year in 10" volume estimated.

The measured outflow and storage volumes were combined to obtain inflow values. These measured values, obtained between March 15 and May 16, 1969, were used for the 10-year flood inflow hydrograph. The relationship experience of other similar streams was used to derive the 100-year flood inflow hydrograph. These hydrographs were used, as explained under "Engineering Investigations" for the design of the lake outlet and channel structures.

The measurement of outflow from Newman Lake Watershed was made at a location near the sink and included all measurable runoff contributing to the sink. Much of the area tributary to the stream below the lake outlet is noncontributing due to the pervious nature of the soil, the forest canopy, and its underlying layer of duff. Areas that do contribute to the stream below the lake are lower in elevation than most of the area tributary to the lake and as a result, runoff occurs here before major flows enter the lake. Allowance was made for the volume of the lowland outflow into the sink. Channel capacity is adequate as this floodwater flow will have been completed before the major outflow from the lake begins.



Detailed soils information for the Newman Lake Watershed was obtained from the recently published Spokane County Soil Survey. Curve number estimates were made from soil series and types, with the assistance of watershed cover reports from the Forest Service and from visual inspections of the watershed areas. The curve number assigned to those areas contributing to Newman Lake was 69. Those areas lying below the lake drainage were assigned curve number 53. Synthetic hydrograph computations verified the frequencies assigned to the 1969 spring flow.

Rainfall data were obtained from the Spokane City Weather Station, the Spokane International Airport, and the Mount Spokane Weather Station. Both the city and the airport stations have long years of record, and these data are considered good.

### Geology Investigations

Investigations were undertaken of sites for the following proposed works of improvement: (1) lake regulating structure foundation; (2) water table regulating structure foundation; (3) channel improvement; and (4) sink area improvement. Intensity of the geology investigations was deemed sufficient to demonstrate the feasibility of the sites and to assist in making construction cost estimates. Logs of test holes are shown in the preliminary plans.

The lake outlet structure will be founded on pre-Cambrian age gneissic bedrock. Depths to bedrock vary from 6.0 feet to 15.0 feet at the site. The bedrock is overlain by variable thicknesses of peat, pumice, and sand. Rock core samples of the bedrock were taken for visual examination. A total of seven test borings were made at the site. Due to the configuration of the bedrock, minor rock excavation will be necessary. Foundation conditions are suitable for construction of the proposed structure.

Two test holes were bored at the proposed water level control structure site. Penetration resistance tests were made at five-foot vertical intervals, and disturbed samples were taken for laboratory analysis. The structure will be founded on silty sands and poorly graded sands of medium density. These glacial fluvial deposits will offer stable support for the proposed structure.

Six test holes were bored along the lower two-mile reach of the Newman Lake outlet channel. Three of the test holes were bored with a drilling rig and three test holes were augered by hand. Disturbed samples were taken for mechanical analysis of all boring sites and penetration resistance tests were made at five-foot vertical intervals at three of the boring sites. The purpose of the investigations was to determine channel design criteria.

The existing channel has stable side slopes of approximately 1.5 to 1. The channel soils consist of medium to dense sands. The proposed new

channel bottom will be supported on similar type soils at lower elevations. These soils will provide stable support for the proposed channel with side slopes of 1.5 to 1.

No bedrock was found during the channel drilling program. There may be a possibility of encountering some rock during channel construction but such was not found during the explorations.

The disposal of outflow waters from Newman Lake is accomplished by seepage through sands and gravels that underlie a sink area in the lower part of the watershed.

Ten test pits were dug within this sink to sample and classify soils and estimate seepage rates. From the soil logs, a map was drawn to show the extent and thickness of silts that overlie the permeable glacial sands and gravels. This map was used in measuring the area having exposed sands and gravels and the area where the sands and gravels are mantled by silts. Seepage rates of the silt mantled area and of the sands and gravels were estimated by using the effective D10 grain size permeability curves. The total estimated intake rate of the improved seepage basin was computed at 540 acre-feet per day. A value of 350 acre-feet per day (175 cfs) was selected for design.

#### Forest Land Investigations

About four-fifths of the area tributary to Newman Lake is forest land, and about the same proportion holds for the total watershed. There is a dense forest cover everywhere except on some rocky ridges. Even here there is a fairly dense brush cover. Stands are uneven-aged, predominantly mixed conifers, with many in sawtimber transition. The area was extensively logged following the turn of the century and sporadic logging has taken place the last 20 years. These relogged areas usually have a satisfactory understory.

The forest cover is composed entirely of mixed forest types. Douglas-fir or western larch are the main species, associated with varying amounts of ponderosa pine, western white pine, lodgepole pine, white (Grand) fir, western hemlock, or western red cedar. The patches of hardwoods are composed mainly of cottonwood and western paper birch. These patches of hardwoods and brush provide good wildlife cover and browse.

The present fire protection facilities are considered to be adequate for this watershed. Except for the improved property around the lake where the rural fire district provides protection, the forest land is protected by the Northeast Area Management Unit of the Department of Natural Resources. The acceptable annual fire loss for the Department of Natural Resources' Northeast Area Management Unit is one-tenth of



one percent, or 1,212 acres, in eight of each 10 consecutive years. Most fires begin from lightning strikes. In the last 17 years, there have been no forest fires over two acres in size within this watershed.

The forest land is state- and privately-owned. Of the 2,320 acres of state-owned land, 1,469 acres are in a state park and 851 acres are under management of the Department of Natural Resources. Two owners hold about 4,500 acres of land; the remaining 15,000 acres of forest land is in holdings of 160 acres or less.

State park lands, known collectively as Mount Spokane State Park, extend along the ridgetops at the head of the watershed. Present plans are to leave these lands undeveloped except for some trail construction. Adjoining state lands may be incorporated into the park system when expansion is needed.

Merchantable timber on the lands managed by the Department of Natural Resources is about 100 years old. The only cut contemplated in the near future is a sanitation cut. Fire, insect, and disease control are primary functions in the management of these lands.

Convenient accessibility of a section of state-owned land on the southeast side of the watershed gives it special consideration. Presently there is a grazing lease on a portion of the area and an application is on file to lease the remainder. The Department of Natural Resources is developing a recreation site here for handicapped people. A half-mile of recreation road, a series of small dams to create shallow pools, and picnic and campground facilities, are some of the improvements associated with this project.

When the forest stands become merchantable, the owners begin cutting the sawtimber trees. Usually an adequate residual understory is left, and the ground cover is not disturbed enough by logging to cause erosion. The main problem associated with timber removal is some erosion from roads which have been left with improper drainage. Areas of granodiorite soils are most susceptible to this type of damage. Following harvest, roadbanks and skid trails are generally seeded to grass. To provide ease of access for fire protection, roads which need attention are regraded with an outslope and culverts are cleaned or replaced.

Since erosion of roads is a source of sediment, road maintenance is important.

Owners who cut their timber will be encouraged to take proper conservation measures to protect the timber and water resources.



## Fish and Wildlife Investigations 1/

### Fish

The principal game fish in Newman Lake are rainbow trout and miscellaneous spiny-ray fishes. Thompson Creek provides important spawning habitat for brook and rainbow trout. The outlet stream below the lake has no fishery value. The Washington Department of Game has been planting between 65,000 and 100,000 catchable rainbow trout in Newman Lake each spring since 1945. Because of present water level fluctuations and inadequate fish screening, the Department has not developed the lake's full potential. However, the Department considers the lake to have a very large undeveloped fishing potential.

Newman Lake presently supports about 8,500 angler-days annually. Fishing success is considered poor for trout and fair for largemouth bass. Public boat launching facilities and several resorts provide excellent fishing access and recreational opportunities. The lake's shoreline is highly developed with summer and permanent homes.

Substantial fishery benefits can be anticipated if the lake level is stabilized and fish screens are installed at the proposed outlet structure. It is estimated that with project conditions, including fish screens, Newman Lake would support 71,000 angler-days annually, with an average annual value of \$142,000, for the life of the project. During a similar period without the project, angler-days would average 13,000 annually. Thus, under project conditions with screens, angler days would increase by 58,000 annually. With stable water levels and adequate fish screens, the Department of Game will be able to justify increasing the number of fish they plant annually, and rehabilitation of the lake when feasible for optimum species management. Costs of these measures considered, the average fishery benefit would be \$127,000 annually. Without fish screens, under the project conditions, no significant fishery benefits would occur.

Discounted net benefits of \$22,400 were used for project justification (see "Economic Investigations and Analyses").

### Wildlife

White-tailed deer and black bear are the only big game animals common to this watershed. Good hunter use is reported.

Upland game birds present include ruffed grouse, ring-necked pheasant, and California quail. Present hunting pressure on these species is light and not considered important.

1/ From field reconnaissance report, Fish and Wildlife Service.

In spring and summer a variety of both diving and dabbling ducks use the area for nesting, feeding, and resting. Hunting opportunities, however, are only minor.

Mink and muskrat are the only important fur-bearers inhabiting the area, and a few are trapped in the watershed. Only temporary adverse effects upon these animals is expected because of project construction activities.

Wildlife habitat could be maintained if any construction-disturbed soils which are suitable for supporting vegetation but do not revegetate naturally are seeded with a mixture containing ladino clover and various grasses, including fescues. Existing vegetation should be retained wherever possible.

### Economic Investigations and Analyses

A preliminary investigation was made of the Newman Lake Watershed. It was agreed that the damage appraisal should be based on a stage-frequency relationship around the lake, and on a stage-duration relationship for the cropland.

Stage-frequency curves were developed for the area around the lake. Duration vs. frequency, and peak flow vs. duration curves were developed for the area below the lake. These curves were developed from information obtained from local people and from field survey data on storage volume, area flooded, and precipitation and runoff. A random sample damage survey covering approximately 10 percent of the lakeshore owners was made to determine the types and extent of damages from flooding in the spring of 1969. Three farmers in the area were interviewed concerning this same flood. It was determined from the stage-frequency curve that this was a 10 percent frequency of occurrence flood. The points of incipient damage were found to be: (1) a lake level of 2125.6 feet for the property around the lake; (2) a lake level of 2126.1 feet for the agricultural area above the lake; and (3) a channel flow elevation of 2123.8 feet for the agricultural area below the lake. All elevations given are United States Geological Survey mean sea level data.

Reported damages to agricultural land and lakeshore properties were converted to monetary values and summarized in tabular form. These values were then expanded to represent the total area. All crop damages have been converted to adjusted normalized prices. The amortization rate used was 6-7/8 percent for a 100-year period of evaluation.

Estimates of percent of floodwater damage to crops and pastures from floods of various durations were made. From this information, damages to crops and pastures both above and below the lake, sediment damage, and erosion damage, by various durations of flooding, were computed and



a table was prepared showing acres flooded by stage and duration. These values were then placed on a damage-frequency curve and the area was planimetered to derive the annual equivalent damage. These damages were found to be: crop and pasture, \$8,520; sediment, \$600; and erosion, \$200.

Present damages to lakeshore properties were estimated for various frequencies of flooding. These values were then placed on a damage-frequency curve and the area was planimetered to find the annual equivalent damage. Damages to future development were found by taking the lake frontage remaining to be developed and dividing by 50 feet to get the number of lots. These lots were then multiplied by the rate of damage to presently developed lots (as determined by damage surveys). These damage figures were then discounted to take into account a predicted 25-year lag in achieving full potential. The total damage to property annually is \$18,210.

Damages to roads were estimated by the Spokane County Road Department to total \$2,700 annually.

High water in the lake prevents the Washington State Department of Game from planting legal-size fish for as long as 20 days after the opening of fishing season, three years out of every ten. This delay reduces the income of resort owners around the lake due to inability to rent boats during these periods. The cost to the Game Department for feeding the fish, and boat rental income lost to resort owners, are both damages due to flooding, and total \$1,155 annually.

The threat of flooding has forced the Game Department to reduce their stocking policy from 100,000 legal-size trout a year to 64,000 legal-size trout a year. The absence of 36,000 legal-size fish gives a loss of 7,200 fishery days. The value placed on the loss of these days, less the savings in the cost of fish, comes to \$3,600 a year.

Indirect damages due to flooding include increased mosquito breeding and nuisance, detouring for east side lake residents, and delays in property owners moving out to the lake and making use of its esthetic values. Other indirect damages include added cost of testing for possible contamination of domestic water supplies, and inoperative condition of septic tanks. Because of the almost impossible task of evaluating the above damages, it was decided to figure them as being 10 percent of the direct damages. Indirect damages total \$3,500 annually.

More intensive agricultural land use was evaluated by preparing "before" and "after" crop budgets to reflect "with project" and "without project" figures. The average difference, after netting out associated costs, comes to \$27.95 an acre on 658 acres, or \$18,395 annually.



Reducing the floodwater hazard and including the fish screens will allow the Washington Department of Game to manage the lake in a manner most beneficial to the fisheries resource, including rehabilitation when feasible. The Bureau of Sport Fisheries and Wildlife of the Fish and Wildlife Service estimates there will be an additional 50,800 <sup>1/</sup> angler-days per year on Newman Lake when rehabilitation and management work is completed.

The annual net benefit total of \$127,000 estimated by the U.S. Fish and Wildlife Service and the Washington Department of Game was reduced for the following reasons:

1. Value of an angler-day taken to be \$1.50 to conform with Soil Conservation Service policy.
2. Benefits were discounted for an estimated 15-year lag in achieving full benefits.

It has been determined through investigation that 50 percent of the discounted annual net benefit of \$44,800 will go to the fish and wildlife purpose while the other 50 percent will be classified as incidental fish and wildlife benefit due to flood prevention measures. These total annual benefits of \$22,400 to the Fish and Wildlife purpose were used in project justification.

Excessive lowering of the lake level will be reduced by the flood prevention measures. A higher lake level in the fall will add additional recreation days for water skiers, swimmers, and boaters. Incidental recreation benefits from this source were calculated to be \$6,515 annually.

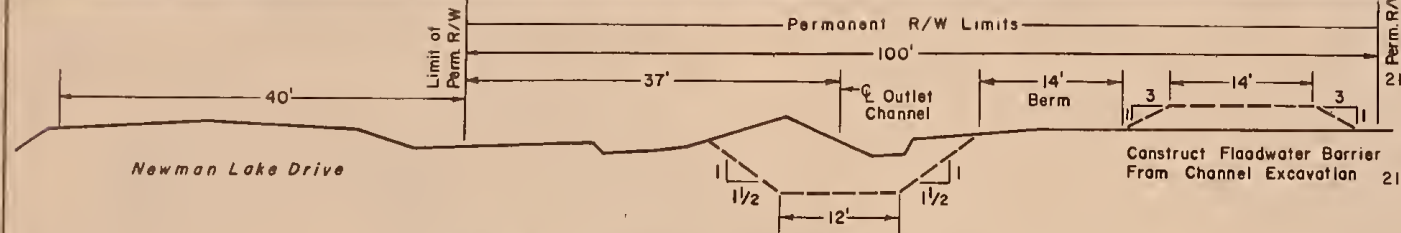
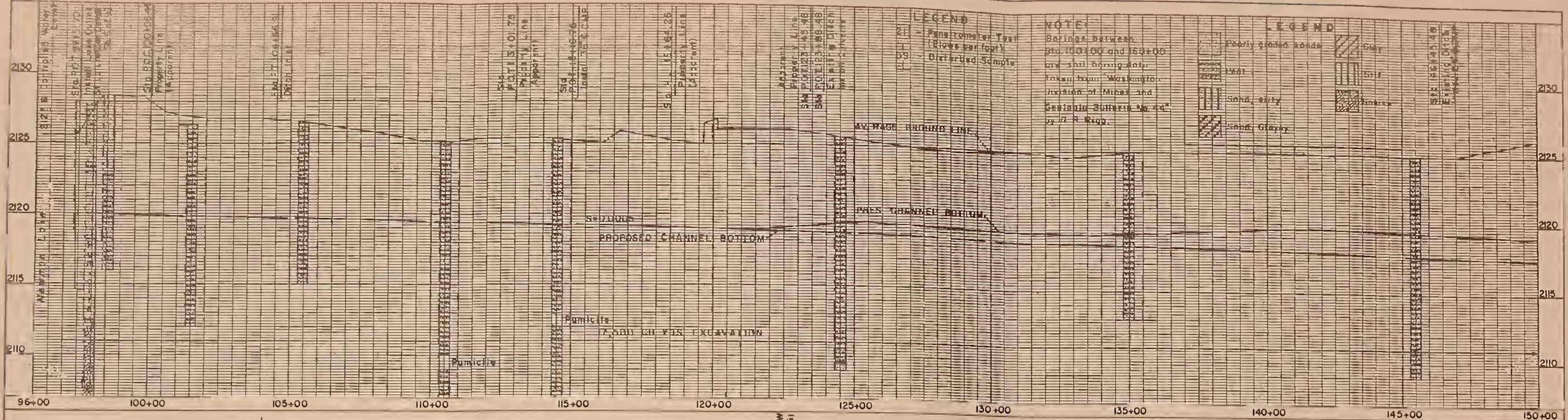
Secondary benefits include increased economic activity of the people in the watershed due to higher yields on crops, greater revenues to established resorts and stores in the area due to the increased opportunities for recreation and fishing, and new job opportunities opened up to serve the needs of a greater number of sportsmen in the area.

Secondary benefits were computed on the primary benefits accruing from more intensive agricultural land use and from improvement of the fishery. "Stemming from" secondary benefits were estimated to be 10 percent of the primary benefits, or \$7,615. Local secondary benefits "induced by" the project were found by taking 10 percent of the associated costs for raising production two tons per acre on agricultural land, and for increasing angler-days by 30,800. These benefits were found to be \$1,425, making a total of \$9,040 annually in secondary benefits.

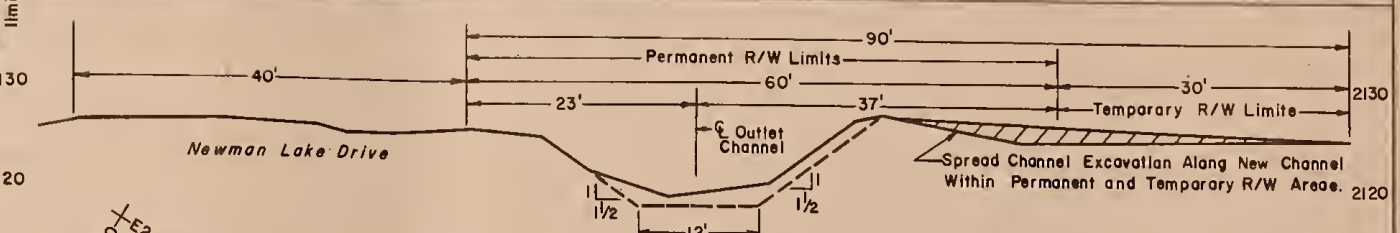
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<sup>1/</sup> The Fish & Wildlife Service reported 58,000 angler-days, but 7,200 of these days are used as a direct damage reduction benefit due to flood prevention measures.

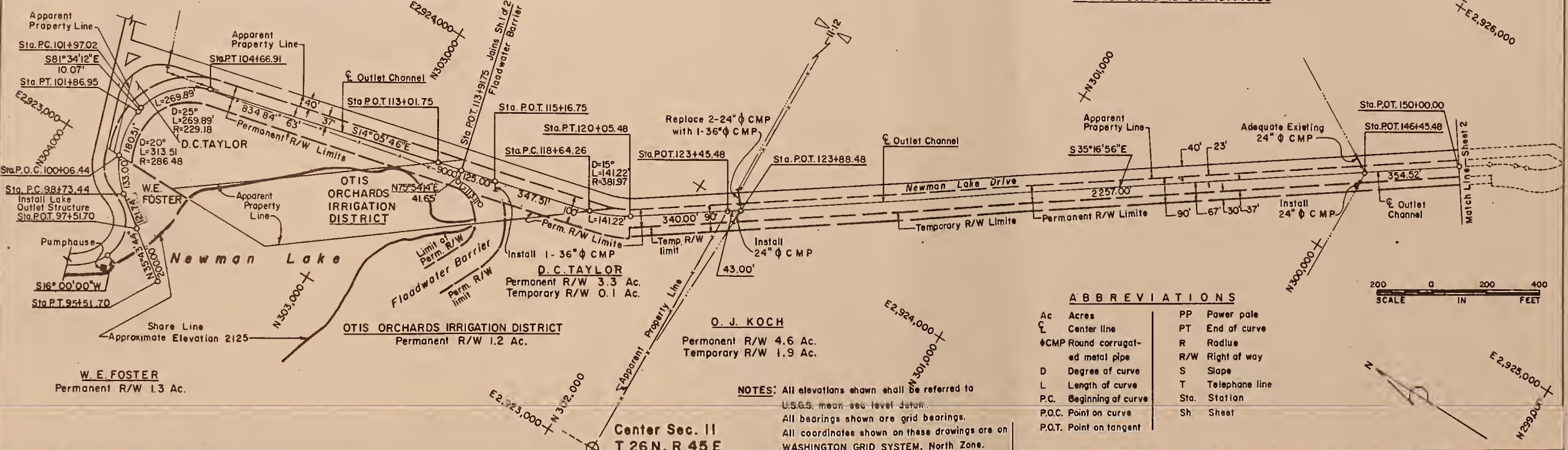




**TYPICAL CHANNEL CROSS SECTION**  
Sta. 104+66.91 To Sta. 113+91.75



**TYPICAL CHANNEL CROSS SECTION**  
Sta. 120+05.48 To Sta. 151+16.33



**ABBREVIATIONS**

Ac	Acres	PP	Power pole
CL	Center line	PT	End of curve
CCMP	Round corrugated metal pipe	R	Radius
D	Degree of curve	R/W	Right of way
L	Length of curve	S	Slope
P.C.	Beginning of curve	T	Telephone line
P.O.C.	Point on curve	Sta.	Station
P.O.T.	Point on tangent	Sh	Sheet

**NOTES:** All elevations shown shall be referred to U.S.G.S. mean sea level datum.  
All bearings shown are grid bearings.  
All coordinates shown on these drawings are on WASHINGTON GRID SYSTEM, North Zone.

U.S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE  
ASSISTING LOCAL SPONSORING AGENCIES

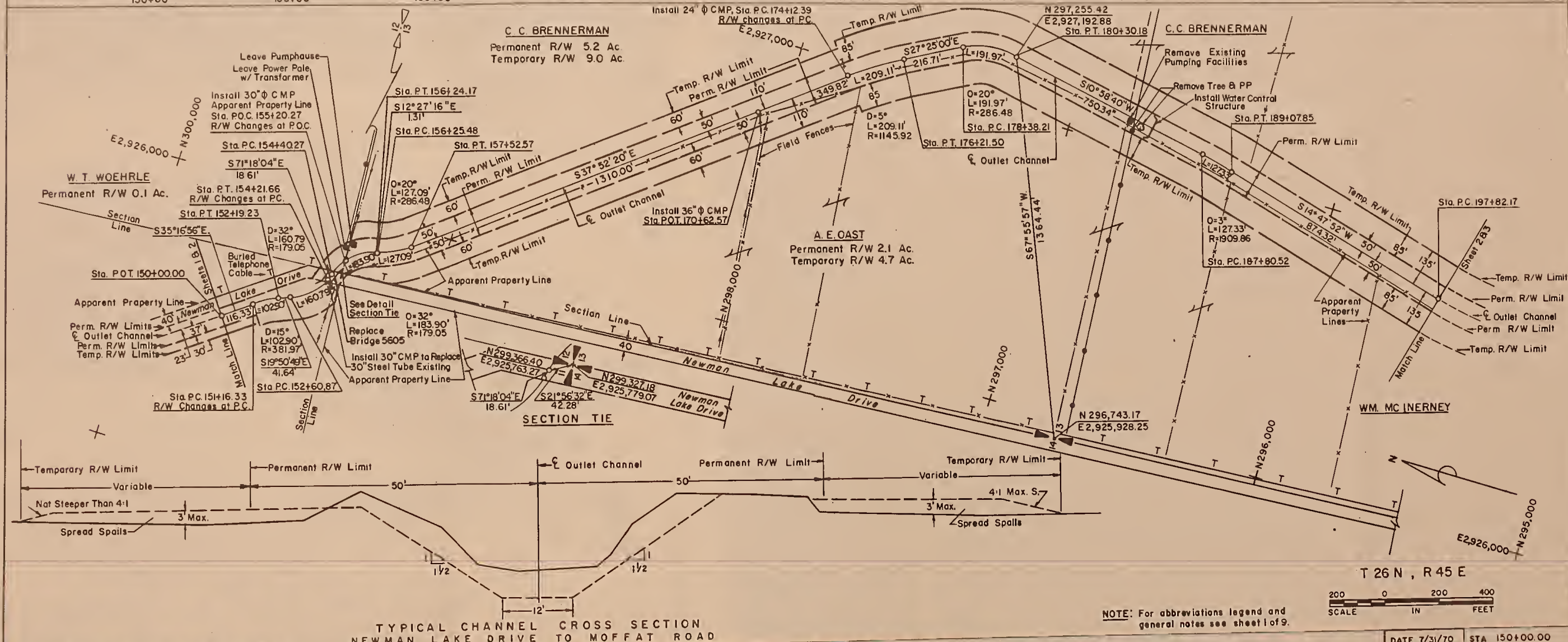
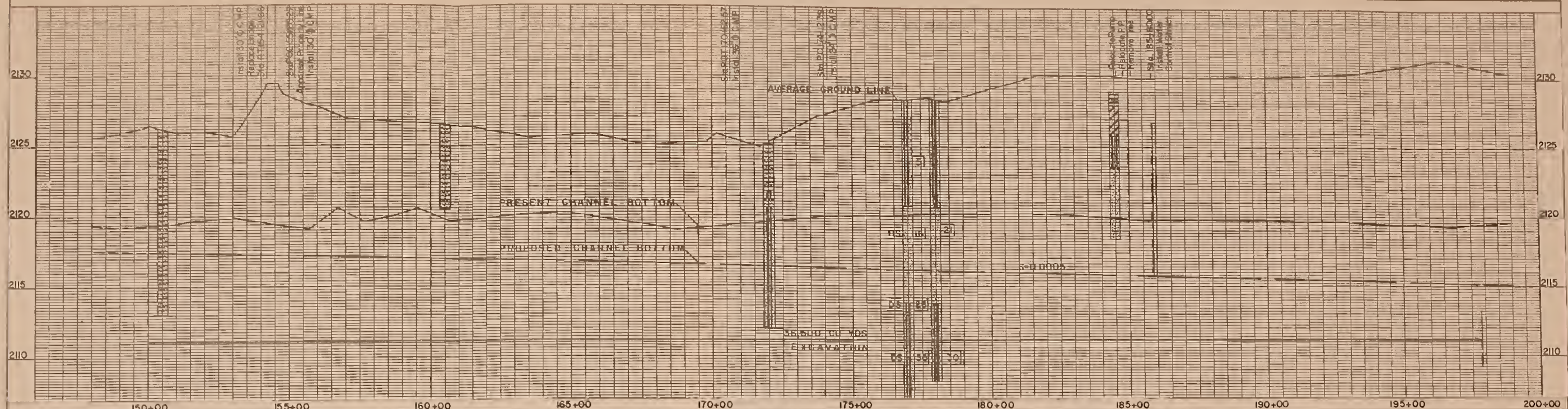
**PRELIMINARY PLANS**  
**NEWMAN LAKE WATERSHED, SPOKANE COUNTY, WASHINGTON**  
**NEWMAN LAKE OUTLET CHANNEL**

DATE 7/31/70	STA 95+51.00
DRAWN VM WW	STA 150+00.00
CHECKED [Signature]	DWG NO.
APPROVED [Signature]	SHEET 1 OF 9 SHEETS



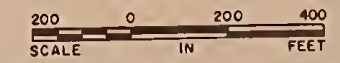






TYPICAL CHANNEL CROSS SECTION  
NEWMAN LAKE DRIVE TO MOFFAT ROAD

NOTE: For abbreviations legend and general notes see sheet 1 of 9.



T 26 N, R 45 E

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SOIL CONSERVATION SERVICE  
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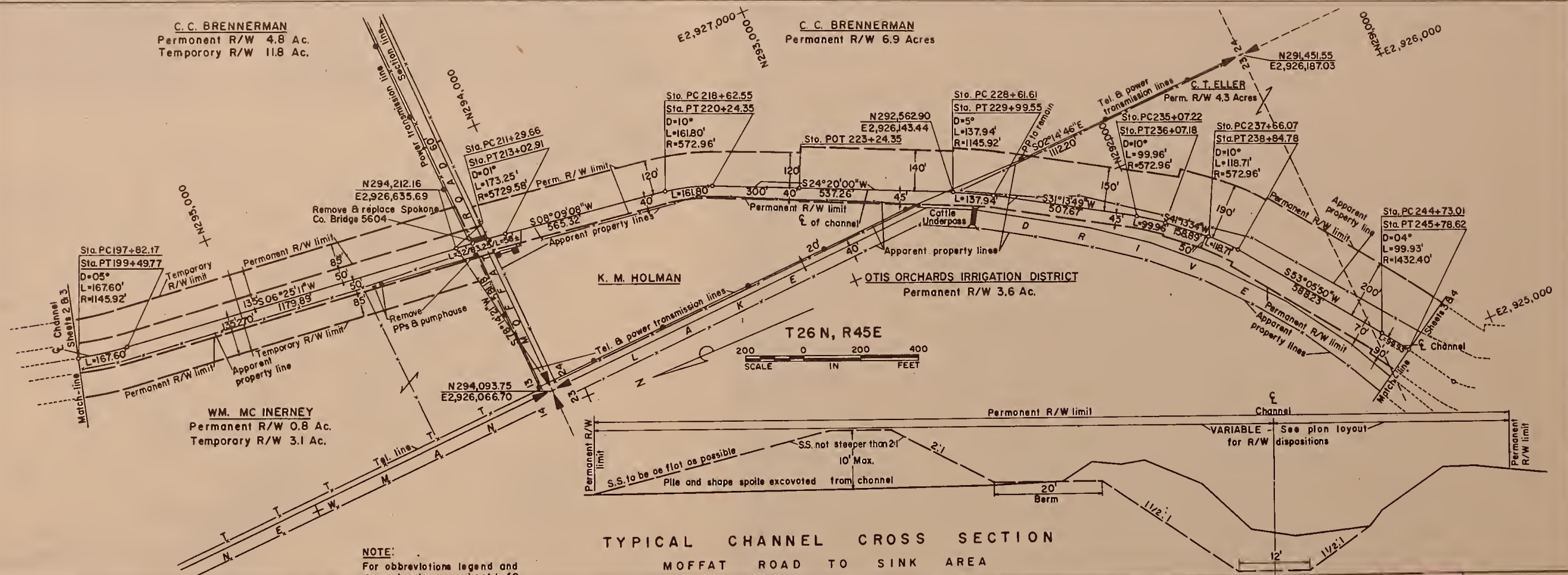
PRELIMINARY PLANS  
**NEWMAN LAKE WATERSHED, SPOKANE COUNTY, WASHINGTON**  
CENTRAL SPOKANE S.W.C.D.      NEWMAN LAKE OUTLET CHANNEL

DATE 7/31/70	STA 150+00.00
DRAWN VM WW	STA 197+82.17
CHECKED <i>[Signature]</i>	DWG NO.
APPROVED <i>[Signature]</i>	SHEET 2 OF 9 SHEETS









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SOIL CONSERVATION SERVICE  
ASSISTING LOCAL SPONSORING AGENCIES

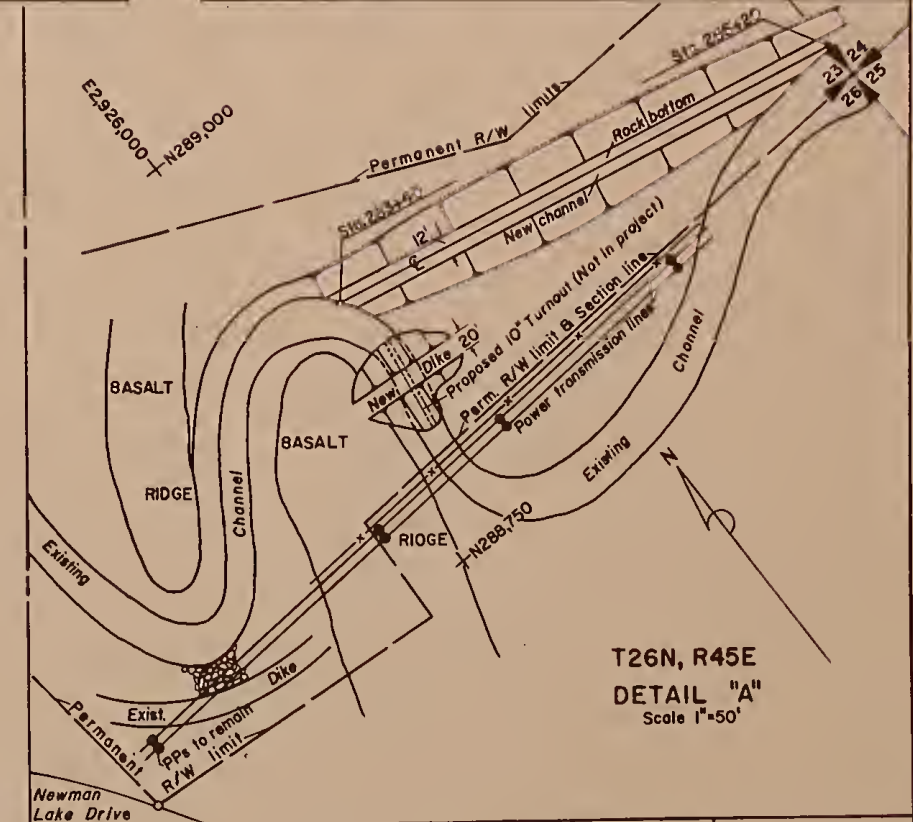
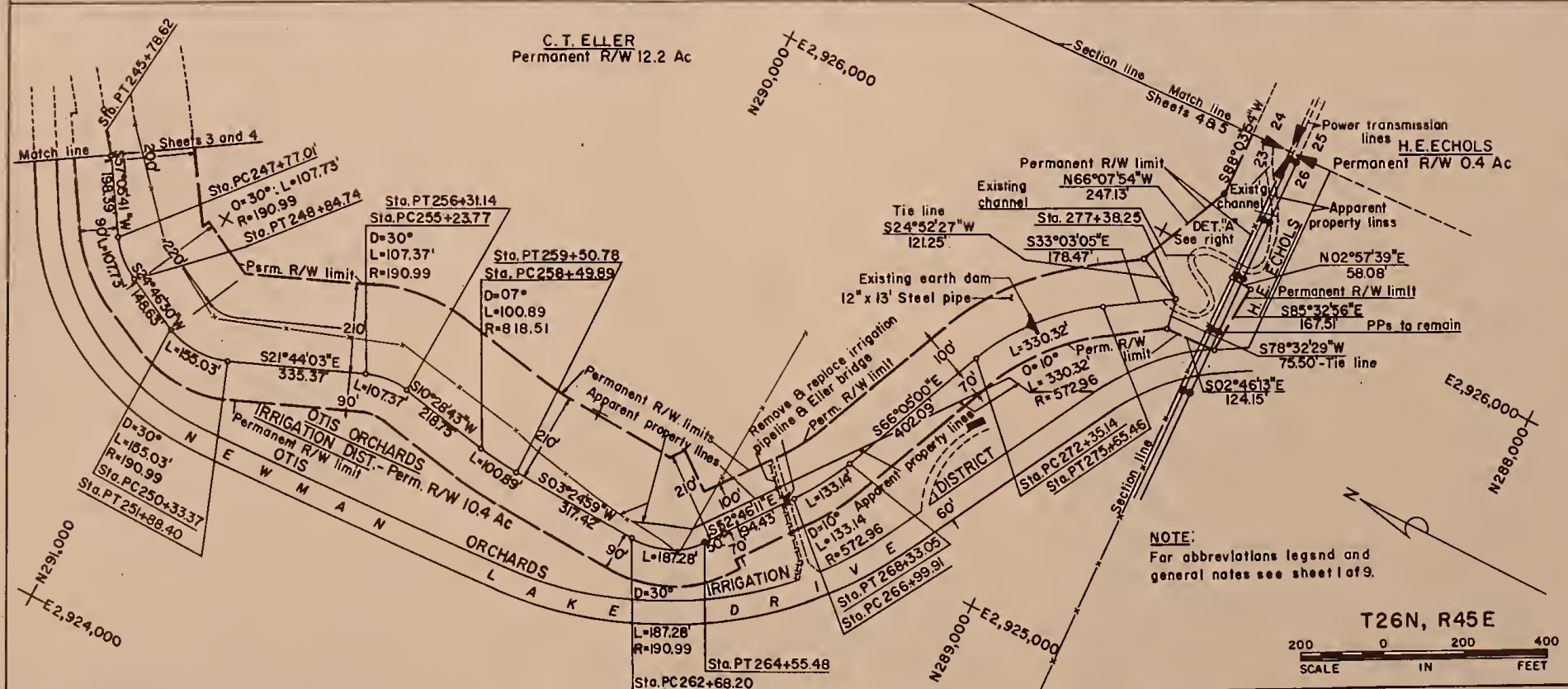
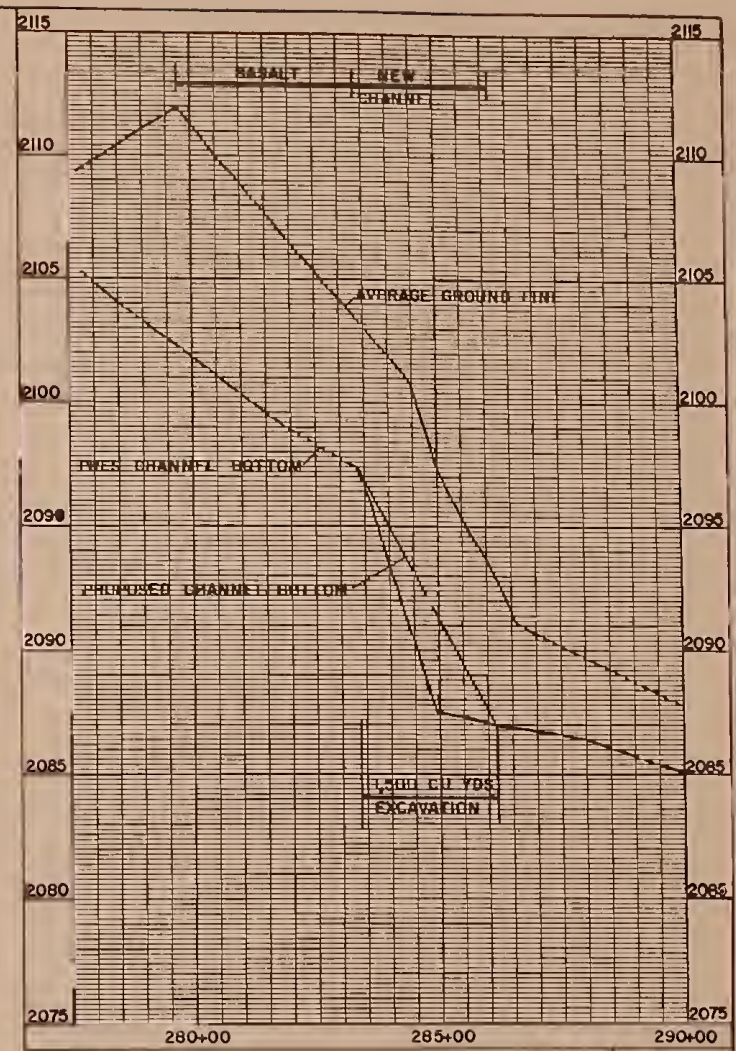
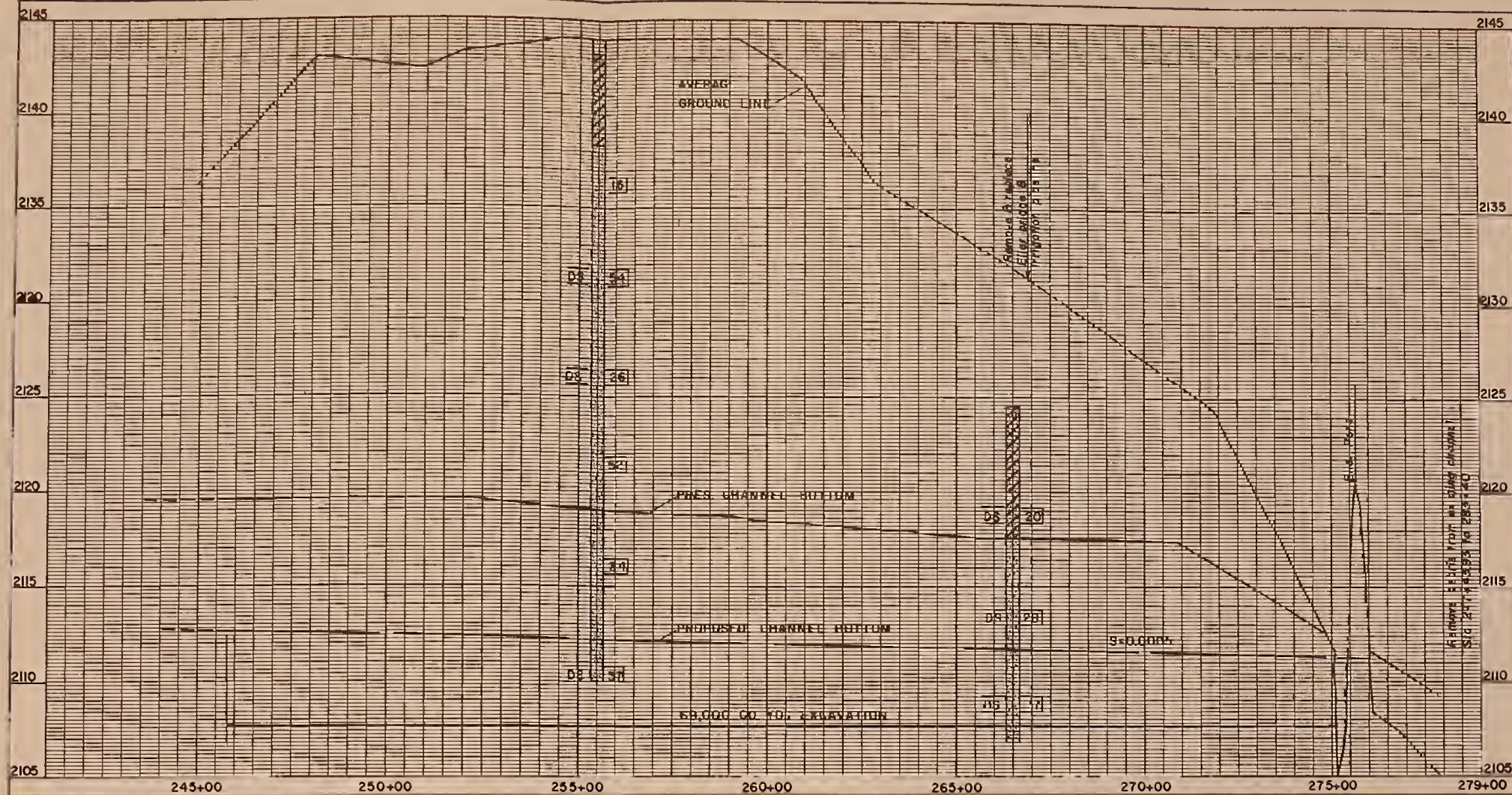
PRELIMINARY PLANS  
**NEWMAN LAKE WATERSHED, SPOKANE COUNTY, WASHINGTON**  
CENTRAL SPOKANE S. W. C. D.      NEWMAN LAKE OUTLET CHANNEL

DATE 7/31/70	STA 197+82.17
DRAWN WW	STA 245+78.62
CHECKED <i>[Signature]</i>	DWG NO.
APPROVED <i>[Signature]</i>	SHEET 3 OF 9 SHEETS









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SOIL CONSERVATION SERVICE  
ASSISTING LOCAL SPONSORING AGENCIES

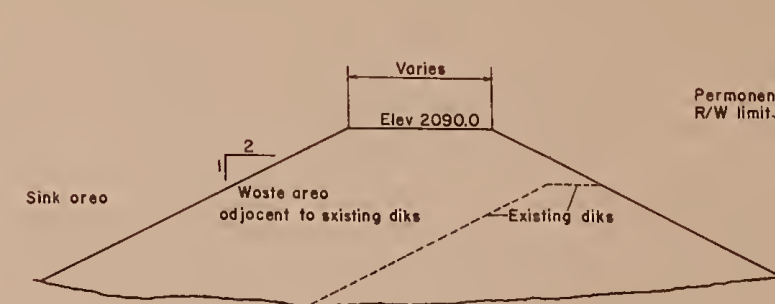
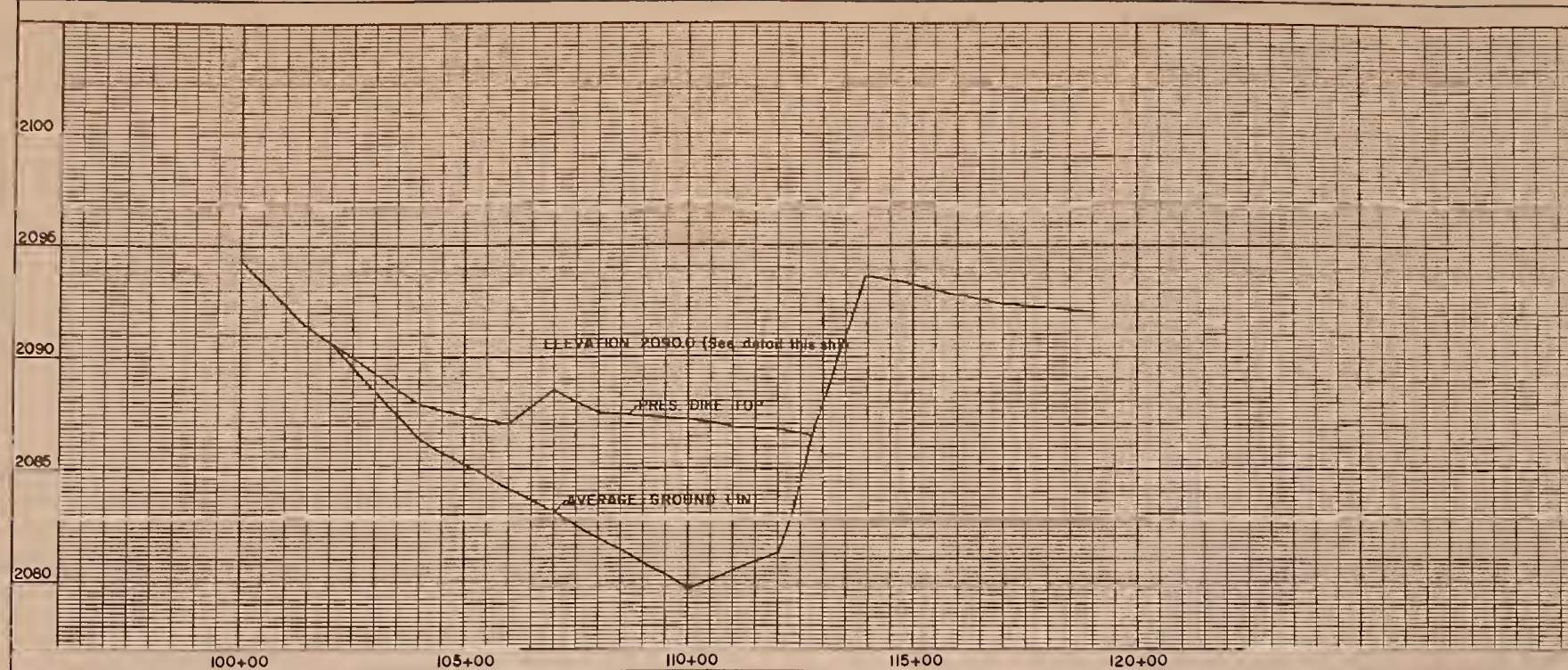
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NEWMAN LAKE WATERSHED, SPOKANE COUNTY, WASHINGTON  
CENTRAL SPOKANE S.W.C.D. NEWMAN LAKE OUTLET CHANNEL

DATE 7/31/70	STA 245+78.62
DRAWN WW AL	STA 286+20.00
CHECKED <i>[Signature]</i>	DWG NO.
APPROVED <i>[Signature]</i>	SHEET 4 OF 9 SHEETS









DETAIL OF DIKE  
AT SINK AREA  
Not to scale  
Note: Side slopes to be not less than 2:1.  
Top variable to accommodate waste.



NOTE:  
For abbreviations legend and  
general notes see sheet 1 of 9.

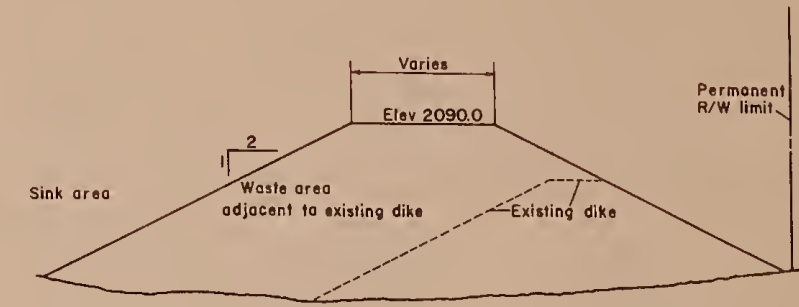
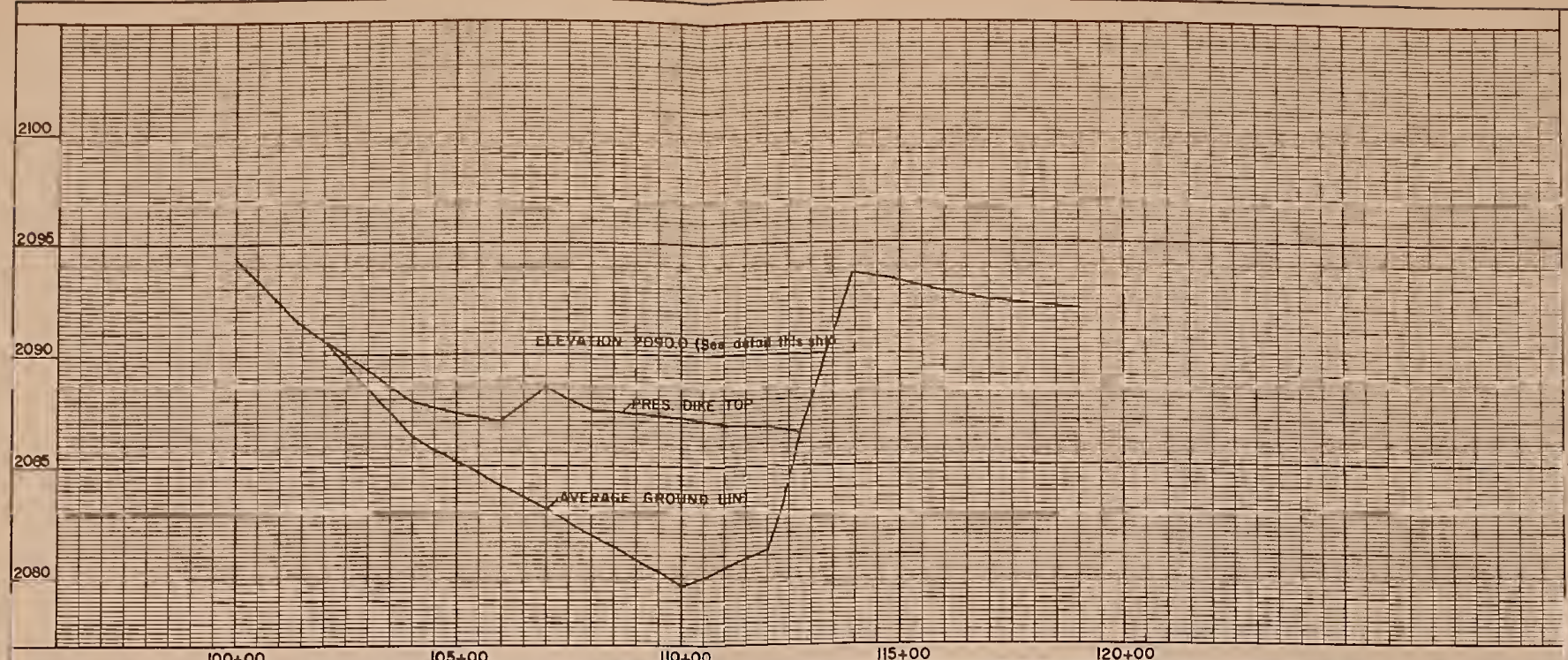
U.S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE  
ASSISTING LOCAL SPONSORING AGENCIES

PRELIMINARY PLANS  
NEWMAN LAKE WATERSHED, SPOKANE COUNTY, WASHINGTON  
CENTRAL SPOKANE S.W.C.D. NEWMAN LAKE OUTLET CHANNEL

DATE 7/31/70	STA 100+00.00
DRAWN WW-AL	STA 120+00.00
CHECKED <i>[Signature]</i>	DWG. NO.
APPROVED <i>[Signature]</i>	SHEET 5 OF 9 SHEETS







DETAIL OF DIKE  
AT SINK AREA  
Not to scale  
Notes: Side slopes to be not less than 2:1.  
Top variable to accommodate waste.



NOTE:  
For abbreviations legend and  
general notes see sheet 1 of 9.

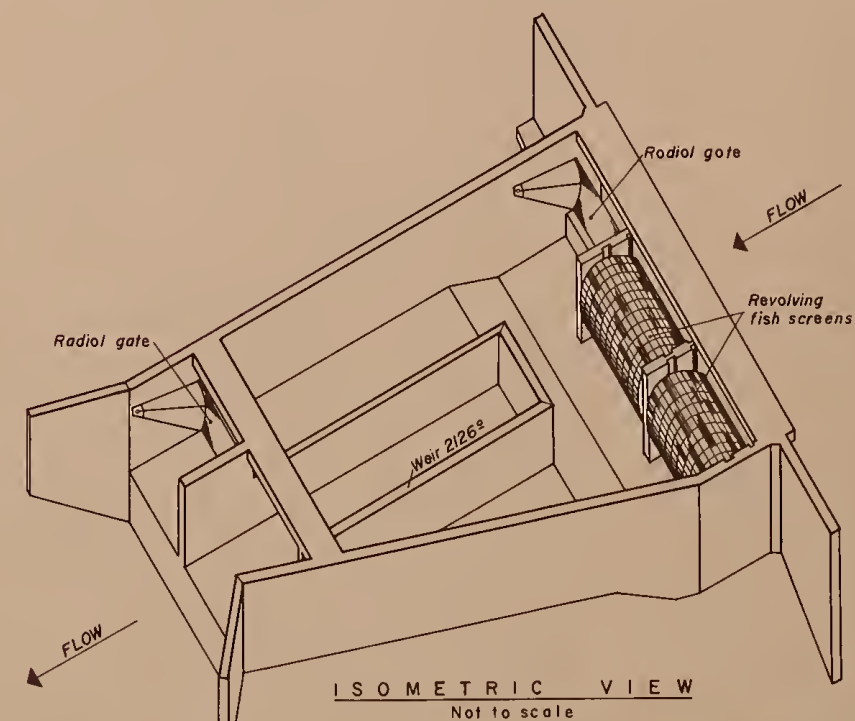
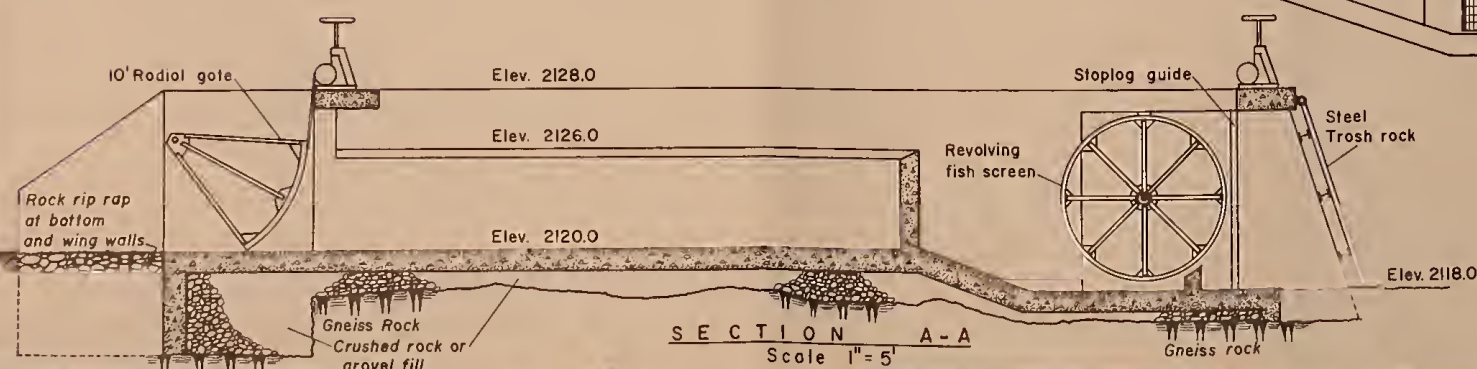
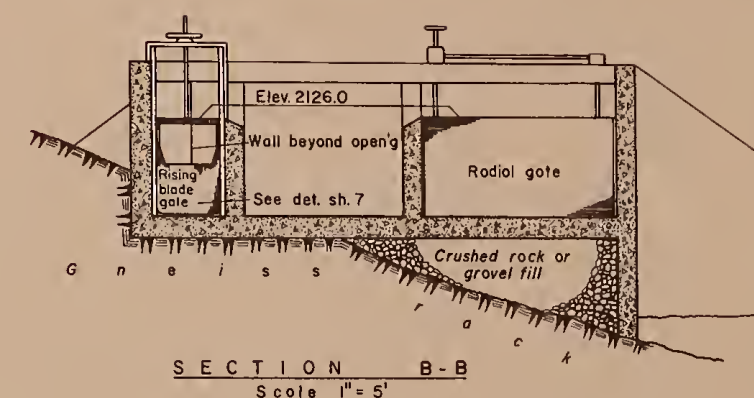
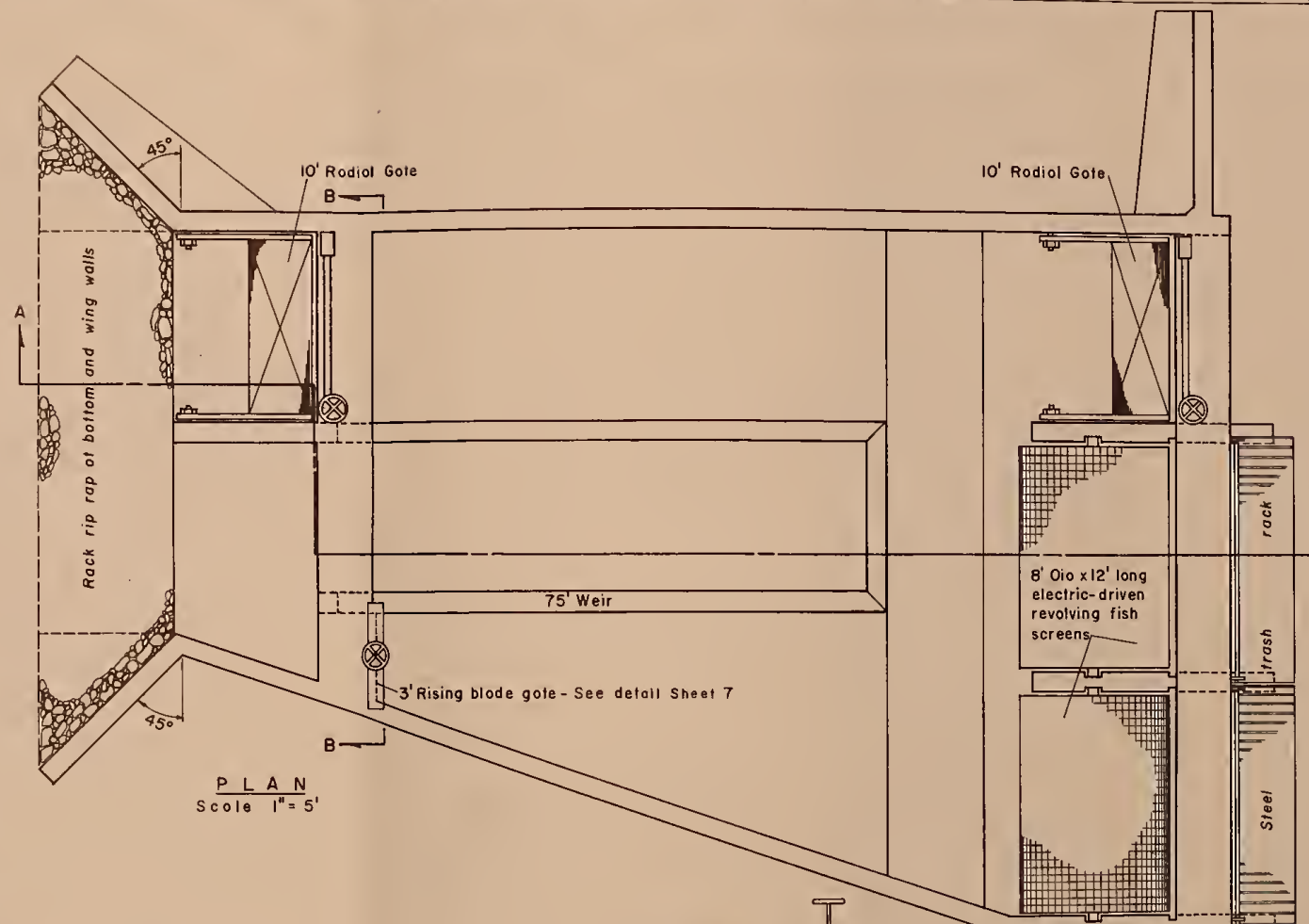
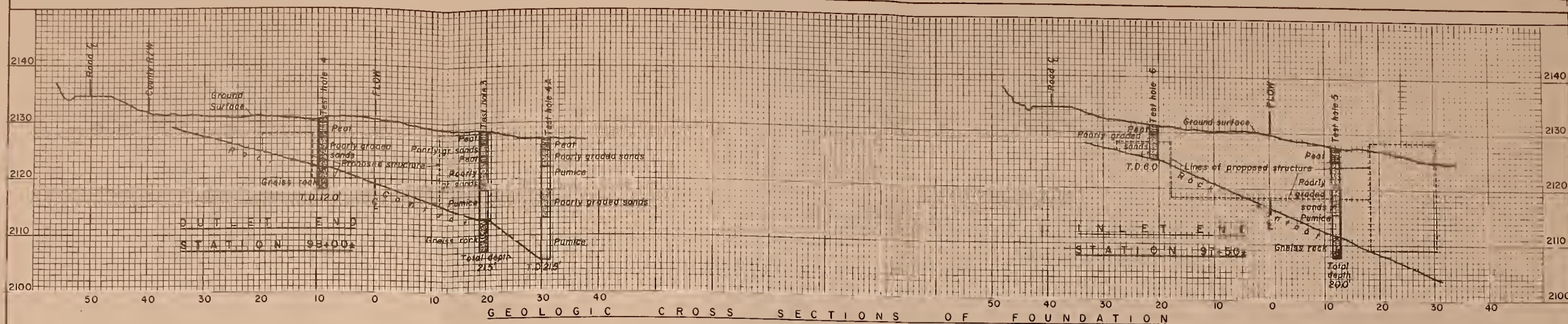
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ASSISTING LOCAL SPONSORING AGENCIES

PRELIMINARY PLANS  
NEWMAN LAKE WATERSHED, SPOKANE COUNTY, WASHINGTON  
CENTRAL SPOKANE S.W. C. D. NEWMAN LAKE OUTLET CHANNEL

DATE 7/31/70	STA 100+00.00
DRAWN WW:AL	STA 120+00.00
CHECKED <i>[Signature]</i>	DWG. NO.
APPROVED <i>[Signature]</i>	SHEET 5 OF 9 SHEETS







OUTLET STRUCTURE

NOTE: For general notes see sheet 1 of

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SOIL CONSERVATION SERVICE  
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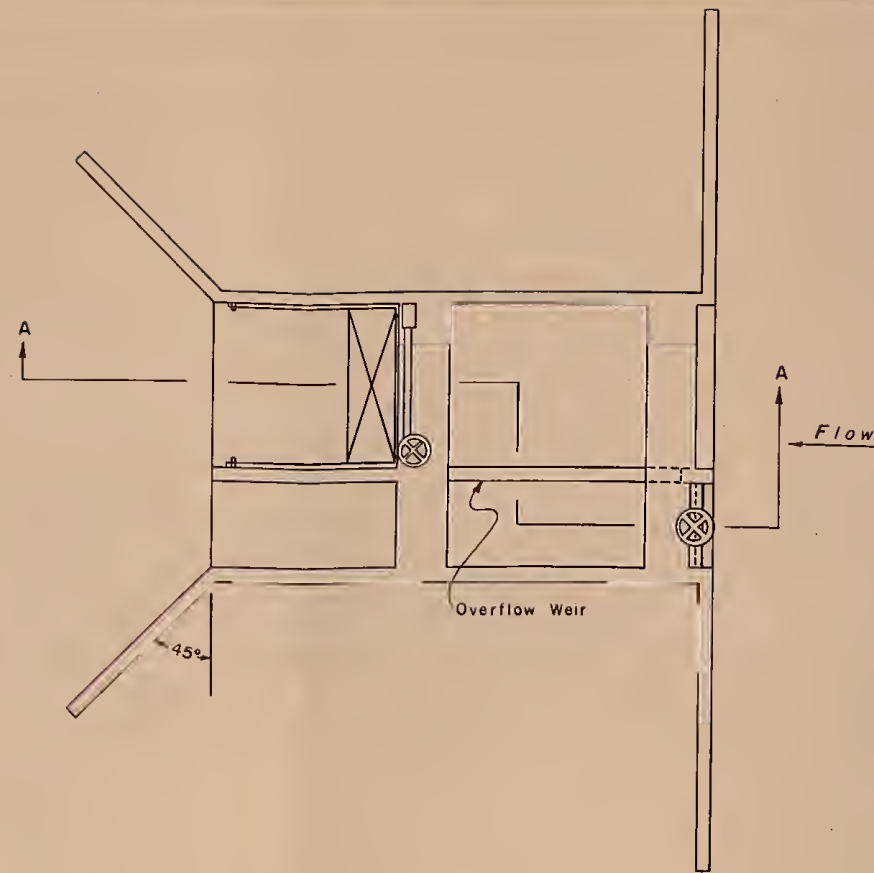
PRELIMINARY PLANS  
NEWMAN LAKE WATERSHED, SPOKANE COUNTY, WASHINGTON  
CENTRAL SPOKANE S.W.C.D.      NEWMAN LAKE OUTLET CHANNEL

DATE 7/31/70	STA
DRAWN WW-AL	STA
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APPROVED <i>[Signature]</i>	SHEET 6 OF 9 SHEETS

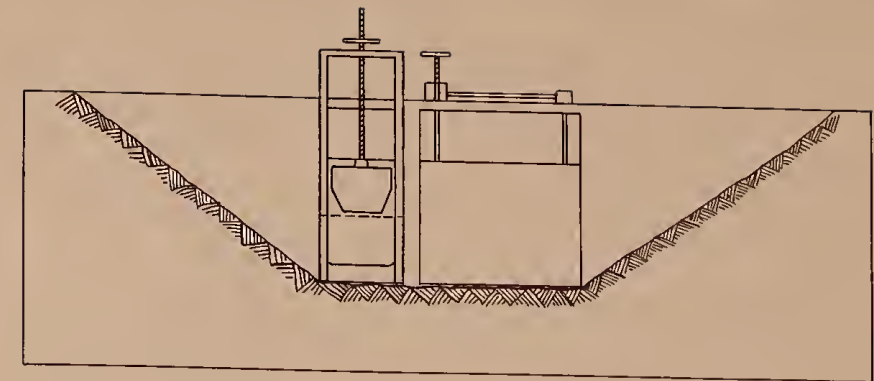




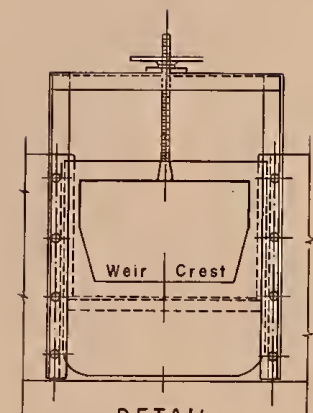




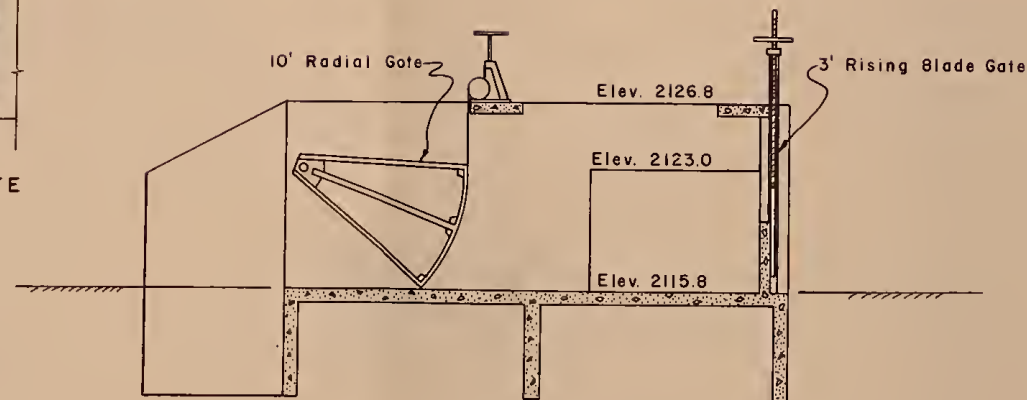
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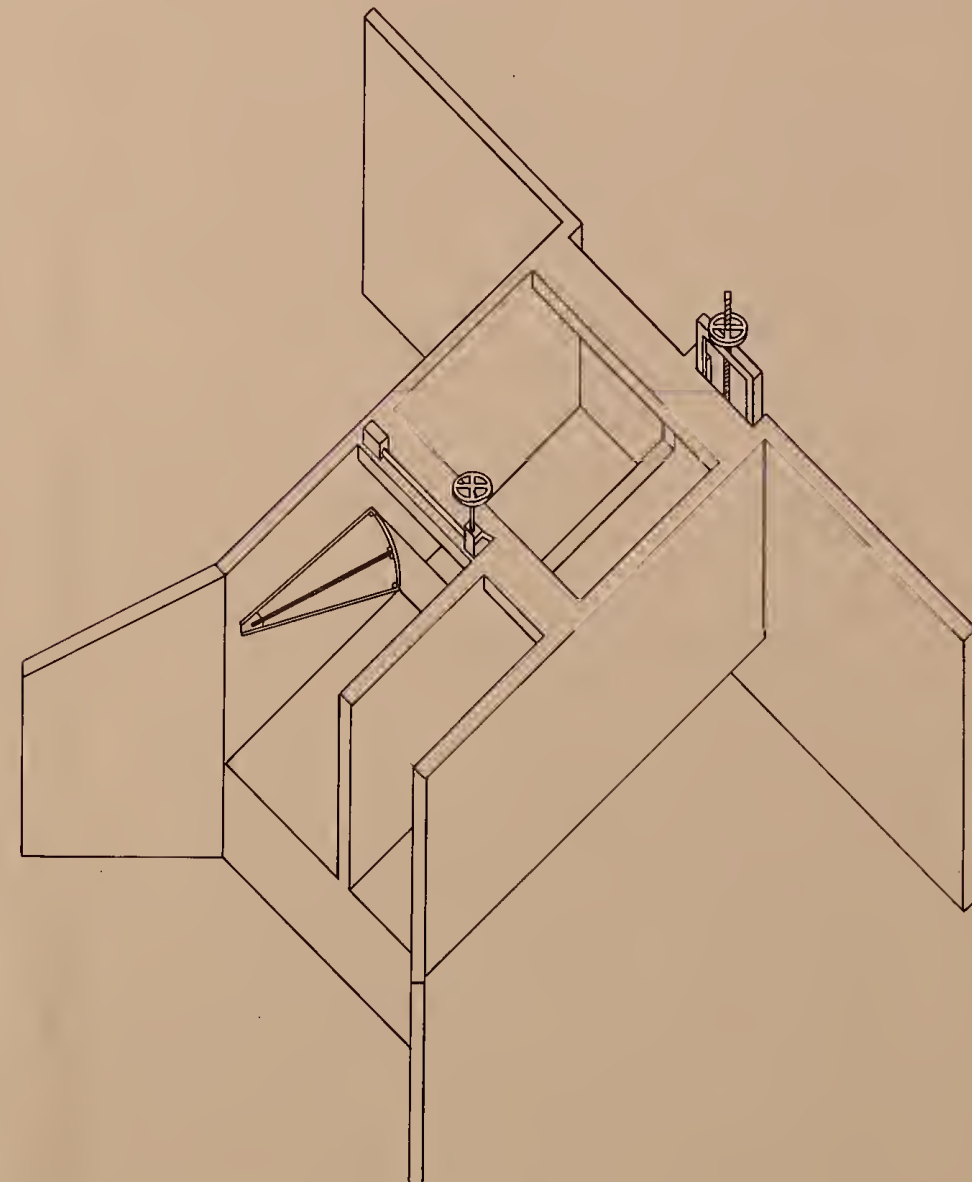
FRONT VIEW



DETAIL  
RISING BLADE GATE  
NOT TO SCALE



SECTION A-A



45° OBLIQUE

# WATER CONTROL STRUCTURE

NOTE: For general notes see sheet 1 of 9.

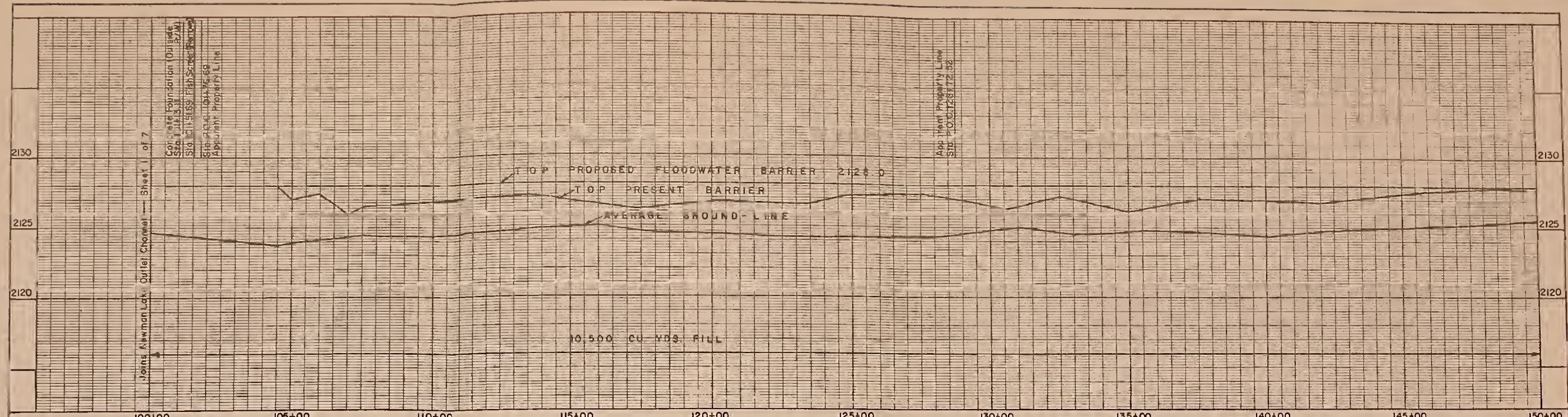
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SOIL CONSERVATION SERVICE  
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PRELIMINARY PLANS  
**NEWMAN LAKE WATERSHED, SPOKANE COUNTY, WASHINGTON**  
CENTRAL SPOKANE S.W.C.D.      NEWMAN LAKE OUTLET CHANNEL

DATE 7/31/70	STA. 185+80
DRAWN WW VM	STA.
CHECKED <i>WV</i>	DWG. NO.
APPROVED <i>WV</i>	SHEET 7 OF 9 SHEETS







- NOTES**
1. Remove All Fences Within Permanent R/W Limits.
  2. All Coordinates Shown Are On WASHINGTON GRID SYSTEM, North Zone. Grid Bearings.
  3. Refer To Sheet I Newman Lake Outlet Channel For Additional Notes.



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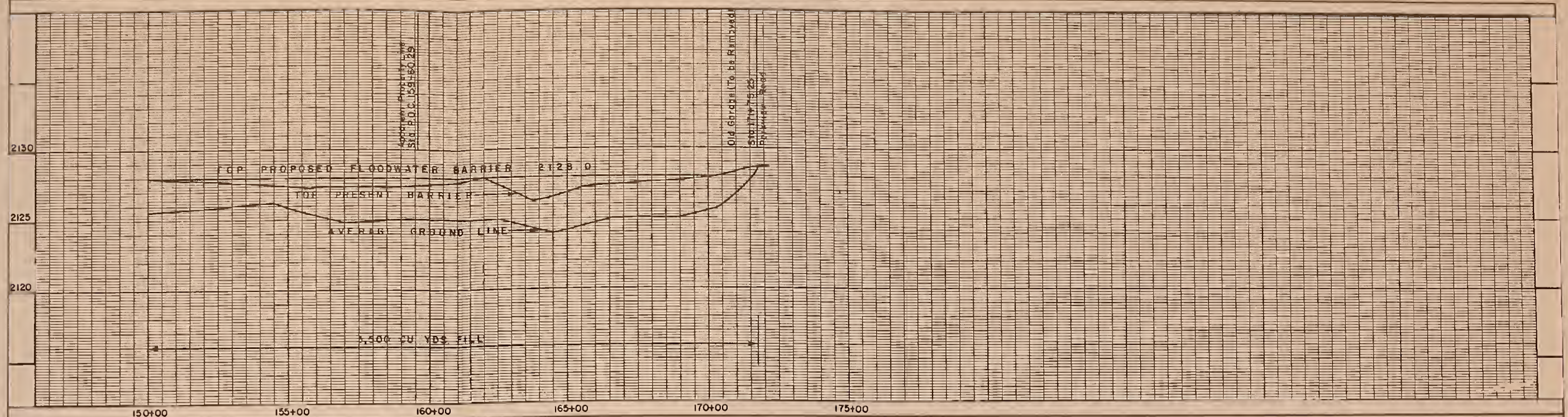
PRELIMINARY PLANS  
 NEWMAN LAKE WATERSHED, SPOKANE COUNTY, WASHINGTON  
 FLOODWATER BARRIER

DATE 7/31/70	STA 100+00.00
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CHECKED [Signature]	DWG NO.
APPROVED [Signature]	SHEET 8 OF 9 SHEETS

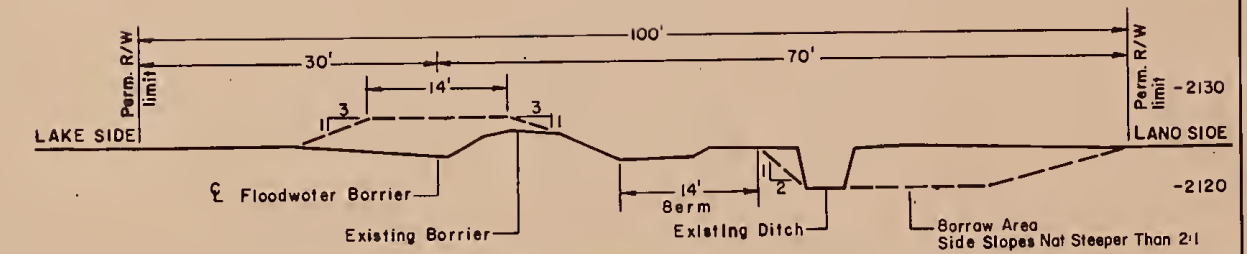




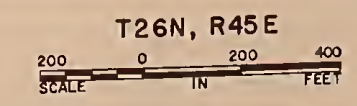




- NOTES**
1. Remove All Fences Within Permanent R/W Limits.
  2. All Coordinates Shown Are On WASHINGTON GRID SYSTEM, North Zone. Grid Bearings.
  3. The borrow area behind the Floodwater Barrier will form a continuous channel outlying into the main channel.



TYPICAL CROSS SECTION — PROPOSED FLOODWATER BARRIER

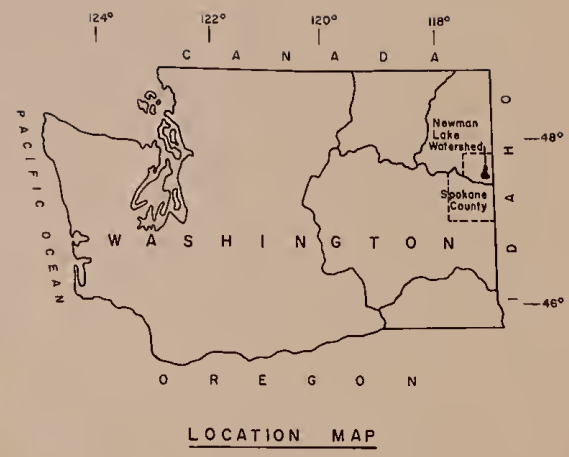
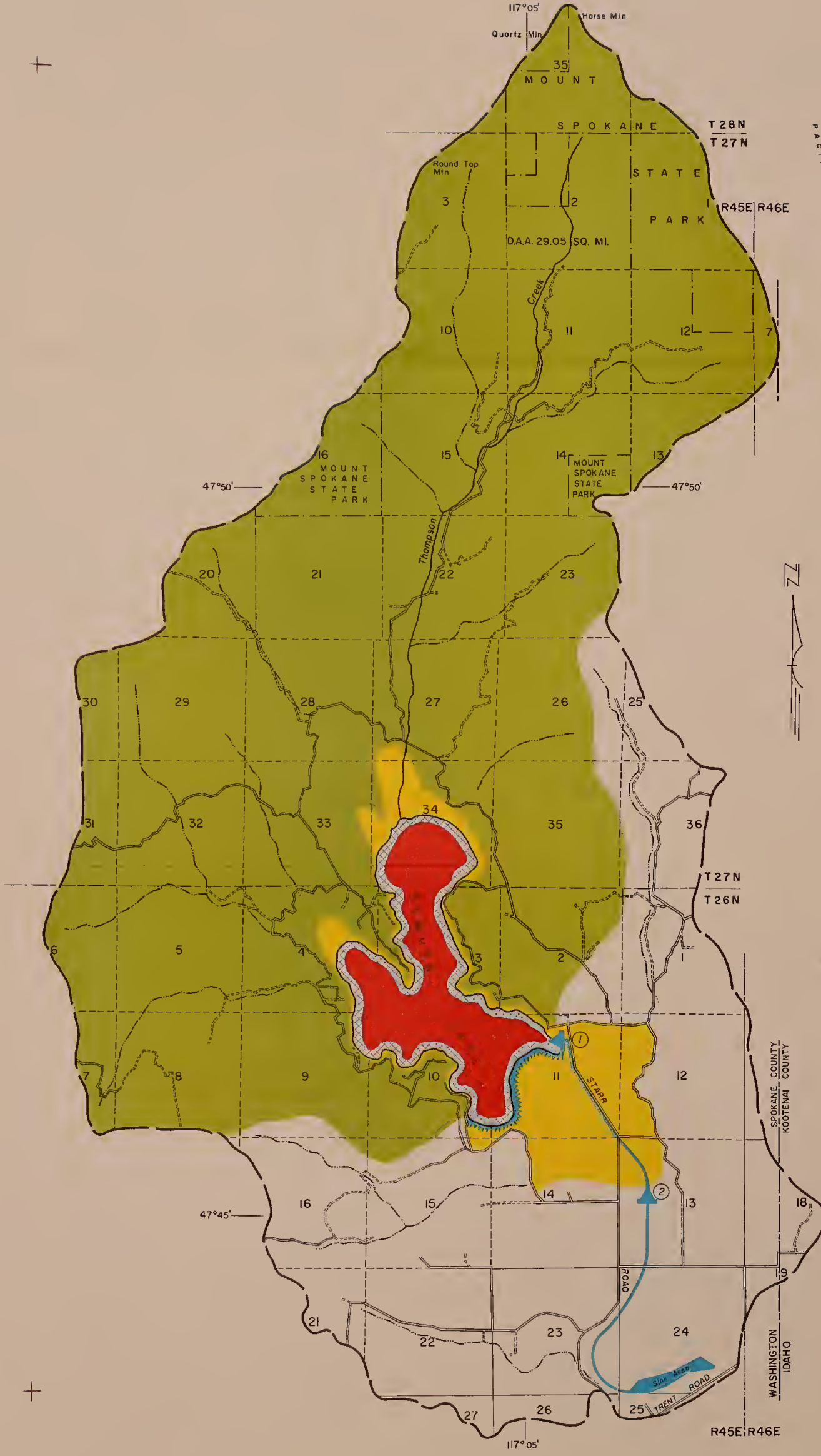


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**PRELIMINARY PLANS**  
**NEWMAN LAKE WATERSHED, SPOKANE COUNTY, WASHINGTON**  
**FLOODWATER BARRIER**

DATE 7/31/70	STA 150+00.00
DRAWN V.M. WW	STA 171+75.00
CHECKED <i>[Signature]</i>	OWG NO.
APPROVED <i>[Signature]</i>	SHEET 9 OF 9 SHEETS





**LEGEND**

- COUNTY LINE
- U. S. TOWNSHIP LINE
- SECTION LINE & NUMBER or 25
- STATE PARK
- IMPROVED ROAD
- FARM ROAD
- PERENNIAL STREAM
- INTERMITTENT STREAM
- PERENNIAL LAKE OR POND
- WATERSHED BOUNDARY
- DRAINAGE AREA CONTROLLED BY STRUCTURE
- AREA BENEFITED
- MULTIPLE PURPOSE STRUCTURE
- STRUCTURE NUMBER
- DRAINAGE AREA ACREAGE O.A.A. 29.05 SQ. MI.
- CHANNEL IMPROVEMENT FOR FLOOD PREVENTION
- FLOOD WATER BARRIER

**PROJECT MAP**  
**NEWMAN LAKE WATERSHED**  
**SPOKANE COUNTY, WASHINGTON**

